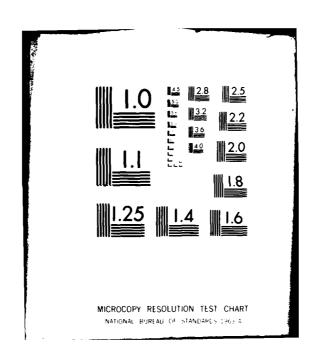
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however, surveys of the dam were made for this inspection. Additional studies should be undertaken to further evaluate conditions affecting the dam. Seepage has been located under the stone masonry wall of the south end of the dam at the junction of the wall and the bedrock. Stability computations performed on the dam indicate it is unstable under the loading condition of ice, seismic, and hydrostatic uplift forces, with an associated factor of safety against overturning of 0.92.

Computations prepared using the Corps of Engineer's Screening Criteria have determined that the embankment would be overtopped for all storms exceeding approximately 1% of the PMF (Probable Maximum Flood). A dam break analysis, assuming a partial breaching of the south dam wall, indicates that water surface levels downstream of the dam would not rise appreciably more than if the dam does not break under high flows. The spillway is, therefore, adjudged as not seriously inadequate.

The following remedial actions are recommended: .

- Further investigation regarding the structural stability of the dam should be undertaken. This investigation should include the evaluation of hydrostatic uplift which may exist at the foundation interface and investigation of any tiedown elements which may be presently incorporated in the dam.
- Repairs should be made to eliminate seepage and improve structural stability at the south abutment of the masonry dam section.

It is, therefore, recommended that within 6 months of the date of notification of the Owners, the above-mentioned investigations or improvements of the structure should be undertaken to determine the appropriate mitigating measures to be taken. Within 18 months of the date of notification, appropriate remedial measures should be completed.

#### PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the

downstream damage potential.

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#### PHASE I REPORT NATIONAL DAM SAFETY PROGRAM

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# ASSESSMENT OF GENERAL CONDITIONS

Dam No. 2, located near Antwerp, New York, is a concrete and stone work gravity dam and is classified as a high hazard. The dam impounds a small linear reservoir which is used to regulate flow into the Village of Antwerp water supply system. Visual inspections of the dam did not reveal conditions which constitute an immediate hazard to human life or property. No plans were available, however, surveys of the dam were made for this inspection. Additional studies should be undertaken to further evaluate conditions affecting the dam. Seepage has been located under the stone masonry wall of the south end of the dam at the junction of the wall and the bedrock. Stability computations performed on the dam indicate it is unstable under the loading condition of ice, seismic, and hydrostatic uplift forces, with an associated factor of safety against overturning of 0.92.

Computations prepared using the Corps of Engineer's Screening Criteria have determined that the embankment would be overtopped for all storms exceeding approximately 1% of the PMF (Probable Maximum Flood). A dam break analysis, assuming a partial breaching of the south dam wall, indicates that water surface levels downstream of the dam would not rise appreciably more than if the dam does not break under high flows. The spillway is, therefore, adjudged as not seriously inadequate.

The following remedial actions are recommended:

- 1. Further investigation regarding the structural stability of the dam should be undertaken. This investigation should include the evaluation of hydrostatic uplift which may exist at the foundation interface and investigation of any tiedown elements which may be presently incorporated in the dam.
- Repairs should be made to eliminate seepage and improve structural stability at the south abutment of the masonry dam section.

It is, therefore, recommended that within 6 months of the date of notification of the Owners, the above-mentioned investigations or improvements of the structure should be undertaken to determine the appropriate mitigating measures to be taken. Within 18 months of the date of notification, appropriate remedial measures should be completed.

Dale Engineering Company

John B. Stetson, President

Approved By: Date: 14 (1087)

Col. Clark H. Benn New York District Engineer



Overview of dam spillway looking north. Spillway caps bedrock providing reservoir area above rapids.

PHOTOGRAPH KEY PLAN

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1. View of reservoir area immediately above spillway area. The reservoir is long and narrow. The bridge crosses the reservoir with a substantial portion of the reservoir upstream of the bridge.



2. Bedrock outcropping and rapids at the dam.



3. Downstream area below spillway.



4. Service spillway passage near south abutment of dam with stop planks removed.



5. View across dam looking north.



 Area between service spillway and south abutment showing seepage between bedrock and masonry wall section.



7. View across spillway from north abutment lcoking south.



 Close-up view of seepage area next to service spillway passage.

# PHASE I INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM NAME OF DAM - DAM NUMBER TWO ID# - 780

SECTION 1 - PROJECT INFORMATION

#### 1.1 GENERAL

#### a. Authority

Authority for this report is provided by the National Dam Inspection Act, Public Law 92-367 of 1972. It has been prepared in accordance with a contract for professional services between Stetson-Dale and Department of the Army, New York District, Corps of Engineers.

#### b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of Dam Number Two and appurtenant structures, owned by the Village of Antwerp, New York, and to determine if the dam constitutes a hazard to human life or property and to transmit findings to the New York District, Corps of Engineers.

This Phase I inspection report does not relieve an Owner or Operator of a dam of the legal duties, obligations or liabilities associated with the ownership or operation of the dam. In addition, due to the limited scope of services for these Phase I investigations, the investigators had to rely upon the data furnished to them. Therefore, this investigation is limited to visual inspection, review of data prepared by others, and simplified hydrologic, hydraulic and structural stability evaluations where appropriate. The investigators do not assume responsibility for defects or deficiencies in the dam or in the data provided.

#### 1.2 DESCRIPTION OF PROJECT

#### a. Description of Dam and Appurtenances

Dam Number Two is a concrete and masonry gravity structure composed of two sections. One section is approximately 192 feet long, the second section approximately 60 feet long. The dam is approximately 12.3 feet high at its highest point. The dam is founded on bedrock and spans the Indian River immediately downsteam from a road used by the Fort Drum Military Reservation. The service spillway consists of a broad crested weir which composes approximately 145 feet of the longer section of the dam. The shorter section of the dam near the south abutment also contains a 4.7 foot long stop plank structure which is used to regulate pond levels. The dam is founded entirely on bedrock. Bedrock outcrops between the two sections form part of the impounding structure. The receiving channel immediately downstream from the dam is composed entirely of bedrock. There are no

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signs of recent erosion. There is some debris lodged in the downstream channel. The impoundment from another dam located in the Village of Antwerp extends to a point approximately 400 feet downstream from Dam Number Two.

#### b. Location

Dam Number Two is located in the Town of Antwerp, Jefferson County, New York. The dam is also located within the boundaries of the Fort Drum Military Reservation.

#### c. Size Classification

The maximum height of the dam is approximately 12.3 feet. The storage volume of the dam is approximately 36 acre feet. Therefore, the dam is in the Small Size Category as defined by <a href="https://doi.org/10.1007/jhe/le/">The Recommended Guidelines for Safety Inspection of Dams</a>.

#### d. Hazard Classification

The Village of Antwerp is located on the Indian River approximately 3/4 mile downstream from Dam Number 2. A Village street spans the Indian River just downstream from another dam located on the Indian River. Therefore, the dam is in the High Hazard Category as defined by The Recommended Guidelines for Safety Inspection of Dams.

#### e. Ownership

The dam is owned by the Village of Antwerp, New York.

#### f. Purpose of Dam

The dam presently impounds a reservoir which is used to regulate flow into the Village of Antwerp water supply system.

#### g. Design and Construction History

A New York State Conservation Commission Dam Report indicates that a dam was constructed in approximately 1885 at a location which approximates the existing dam. This dam was reconstructed in 1912. Data presented by a dam inventory taken by the Fort Drum facility engineer indicates that the dam was constructed in approximately 1925. Investigations at the dam site with the Mayor of the Village of Antwerp indicate that the dam was faced with concrete on the downstream face and capped with concrete in 1967. No other details of construction were available.

#### h. Normal Operating Procedures

The control outlets near the south abutment are used to regulate the level of the downstream impoundment which serves as an emergency source of water supply for the Village of Antwerp.

## 1.3 PERTINENT DATA

#### Drainage Area

The drainage area of Dam Number Two (Fort Drum) is 152.10 square miles.

#### b. Discharge at Dam Site

No discharge records are available for this site.

Computed discharges:

Spillway, top of dam	454 cfs
Ungated Spillway, PMF	62,800 cfs
1/2 PMF	30,100 cfs
Gated drawdown (stop planks)	N.C.

#### c.

Elevation (Feet Above MSL)
Note: There is no U.S.G.S. control in the area. Elevations are given in local datum and approximate U.S.G.S. elevations are given in parenthesis.

Top of dam	123.0	(515)
Maximum pool, PMF	130.3	(522.3)
1/2 PMF	127.4	(519.4)
Spillway crest	121.9	(514)
Stream bed at centerline of dam		
(rapids occur beyond this point)	110.7	(502.7)

#### d. Reservoir

3000+ Ft Length of normal pool

# Storage\*

Top of dam	50 Acre Feet
PMF	410 Acre Feet
1/2 PMF	210 Acre Feet
Normal pool	36 Acre Feet

## Reservoir Area

Spillway pool (very approximate) 8 Acres

<sup>\*</sup>Approximated from U.S.G.S. topographic maps.

#### g. Dam

Type - Concrete Gravity, Capping Bedrock.

Length - 252 feet.

Height - Varies, Maximum Concrete Section 10 feet founded on graded bedrock.

Freeboard between normal reservoir and top of dam - 1.23 feet.

Top width - Varies.

Side slopes - Varies

Zoning - N/A.

Impervious Core - Unknown.

Grout Curtain - Unknown.

# h. Spillway

Type - Broad to sharp crested. Length - 143 feet. Crest Elevation - 121.90 (514). Gates - None. U/S Channel - Reservoir. D/S Channel - Rapids/Bedrock.

# i. Regulating Outlets

4.7 foot long stop plank outlet near south abutment.

# SECTION 2 - ENGINEERING DATA

# 2.1 DESIGN

All the information available to evaluate this dam has been included in this report. The information consists mainly of survey data taken by the dam inspection crew prior to the inspection.

# 2.2 CONSTRUCTION

No information is available regarding the construction of the project.

# 2.3 OPERATION

See Section 4.

# 2.4 EVALUATION

Engineering data cannot cannot be assessed since it is incomplete. No information is available on the materials of construction and the inspection is guided only by visual observations in the field. However, sufficient information has been gathered through the field inspection efforts to provide information adequate for the Phase I investigation.

#### SECTION 3 - VISUAL INSPECTION

#### 3.1 FINDINGS

#### a. General

Dam Number Two on the Indian River was inspected on May 2, 1979. The dam presently functions to maintain water elevations downstream in the Indian River to provide for for adequate emergency water supply to the Village of Antwerp. The Village's main source of water supply are springs which are remote from the river.

#### b. Dam

The dam and spillway system are shown in the sketches prepared by Stetson-Dale in Figures 2 and 3. The dam was originally constructed in 1855, and subsequent modifications have taken place with the last modification having been completed in 1967. At the time of the inspection the flow in the Indian River was cresting the entire length the spillway and the regulating weir near the south abutment was open with all stop planks removed. Because of the flow in the Indian River at this time, the inspection crew was unable to observe the condition of the front face of the dam. However, field observations indicate that the entire structure is founded on bedrock. There was no evidence of misalignment of the top of the spillway or of the concrete dam section. The southerly section of the dam near the south abutment is constructed of masonry. Leakage was detected through the base of the masonry near the south abutment. This leakage was of a substantial quantity at the time of the inspection.

#### c. Spillway

The service spillway was operating at a head of approximately 1 foot at the time of the inspection. Flow over the spillway appeared uniform and there was no evidence of deterioration of the spillway crest as observed with a head of water flowing.

#### d. Appurtenant Structures

There are no structures appurtenant to this dam. No provisions are provided for draining of the dam except for the removal of stop planks in the control outlet.

#### e. Control Outlet

A small stop plank structure is located near the south abutment of the dam. This structure was operating under a head of approximately 2 feet at the time of the inspection.

#### f. Reservoir Area

The reservoir area is generally forested and does not contribute significant amounts of sediment into the impoundment. There are no areas where bank instability exists around the impoundment.

#### g. Downstream Channel

The downstream channel is formed in bedrock and is generally in good condition.

#### 3.2 EVALUATION

Field observations indicate substantial leakage exists at the south abutment of the southerly section of the dam. This leakage appears to occur between the masonry and the bedrock foundation. No displacement or misalignment of the structure was noted during the inspection. The concrete surfaces which were visible appear to be in good condition.

# SECTION 4 - OPERATIONAL PROCEDURES

# 4.1 PROCEDURES

The operation of the stop planks in the control spillway was not observed by the Inspection Team. The Village of Antwerp manipulates stop planks to control the water level in the downstream impoundment.

# 4.2 MAINTENANCE OF THE DAM

The dam is maintained by the Village of Antwerp.

# SECTION 5 - HYDRAULIC/HYDROLOGIC

#### 5.1 DRAINAGE BASIN CHARACTERISTICS

Dam Number 2 is located on the Indian River in Jefferson County just upstream from the Village of Antwerp. The basin has a drainage area of 152 square miles. The upland headwaters contain wooded and marshy areas including Lake Bonaparte from which the river system collects from a complex tributary system and flows north through the Village of Antwerp, eventually discharging into the St. Lawrence River. Alpina dam, a small water level control structure for Lake Bonaparte, is upstream of Dam Number 2.

#### 5.2 ANALYSIS CRITERIA

The purpose of this investigation is to evaluate the dam and spillway with respect to their flood control potential and adequacy. The dam's stability and flood discharge capacity is assessed through the evaluation of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the flood through the dam's spillway system.

The PMF event is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration loss and concentration runoff of a specific location that is considered reasonably possible for a particular drainage area. Since this dam is in the Small Dam Category and is a High Hazard, the guidelines criteria (Ref. 1) require that the dam be capable of passing one-half the Probable Maximum Flood.

The hydrologic analysis was performed using the unit hydrograph method to develop the flood hydrograph. Due to the limited scope of this Phase I investigation, certain assumptions, based on experience and existing data were used in this analysis and in the determination of the dam's spillway capacity to pass the PMF.

The U.S. Army Corps of Engineers, Hydrologic Engineering Center's Computer Program HEC-1DB was utilized to evaluate the PMF hydrology. The Probable Maximum Precipitation (PMP) was 18.50 inches, Hydrometeorological Report (HMR #33) for a 24 hour duration, 200 square mile basin. Loss rates adopted for the analysis were 1.0 initial abstraction and 0.1 inches/hour continuous loss rate. Clark parameters were used to develop the unit hydrograph.

The drainage basin was divided into 12 sub-areas to describe the complex basin geometry. One sub-area was located below the dam so that flood routing could be performed to within the Village. Modified-Puls routing parameters within HECl-DB were utilized with data obtained from USGS mapping. The computed PMF flow at the dam was 62,800 cfs and the 1/2 PMF was 30,095 cfs. Routed flood flows to the village were 62,605 cfs for the PMF and 30,035 cfs for 1/2 PMF.

#### 5.3 SPILLWAY CAPACITY

The spillway system is somewhat unique in that it sets atop of a rapids area with rock outcropping existing below the dam as well as across the dam. Rock outcropping also exists in the center of the spillway. The concrete dam sets on top of the rock with a low flow spillway section of the northern side and a small spillway passage with stop planks on the south side. The low flow spillway capacity is 454 cfs.

#### SPILLWAY CAPACITY

	Discharge	Capacity
PMF	62,800	1.0%
1/2 PMF	30,095	1.5%

Since the entire dam is made of concrete overtopping is most meaningful at the abutment areas which have been found to be largely on rock.

#### 5.4 RESERVOIR CAPACITY

No drawings were available for this investigation. Topographic information derived from USGS mapping suggests the reservoir storage may be only 50 acre feet at the top of the dam. At 1/2 PMF stage, the reservoir total storage is 210 acre feet. USGS maps can only provide a cursory screening level evaluation.

# 5.5 FLOOD OF RECORD

No records, basin ungaged.

#### 5.6 OVERTOPPING ANALYSIS

The HEC1-DB analysis indicates that the dam would be overtopped as follows:

#### OVERTOPPING IN FEET

	At Dam	Bridge at Village
PMF	7.3	13.1
1/2 PMF	4.4	6.2

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Overtopping was performed with a dam break analysis which resulted in an insignificant increase in flood flows for the  $1/2\ PMF$  and PMF. Stability calculations indicated that the dam was stable for both these events, assuming the uplift forces for these events are the same as assumed for normal operating conditions.

#### 5.7 EVALUATION

The spillway is inadequate to pass the 1/2 Probable Maximum flood without overtopping the dam. However, based on the Corps of Engineers' Screening Criteria, it is not considered seriously inadequate, since failure of the dam will not significantly increase the hazard.

#### SECTION 6 - STRUCTURAL STABILITY

#### 6.1 EVALUATION OF STRUCTURAL STABILITY

#### a. Visual Observations And Data Review

Rock outcrops prevail at the location of this dam. Virtually all of the main dam spillway, a concrete structure, is founded directly on the exposed bedrock and/or incorporates the rock as part of the structure. A short section of dam which forms the southerly segment of the total dam structure is "separated" from the main section by a rock outcropping. This separate section consists of masonry and concrete, and includes a service spillway of limited size; this separate dam section and spillway apparently represented the flume area for a water-powered mill, ice harvesting or wood operation which existed at the site in the past. The downstream pool area immediately below the dam consists essentially of rock.

The main dam and spillway section retains stability at this time with no indication of structural distress. The physical condition of the concrete visible at the time of the inspection is good. The separate masonry section forming the southerly segment of the total dam appears structurally stable but some of the masonry rock elements have experienced limited movement, probably from frost effects, and noticeable seepage occurs through the section. This section occurs at the junction with bedrock.

## b. Geology and Seismic Stability

The Antwerp Dam and reservoir is located within the western edge of the foothills of the Adirondack Province. The New York State Conservation Report of September 14, 1914, indicates the dam is sited on solid rock. Both abutments terminate in bedrock and bedrock also forms a portion of the spillway. Bedrock is a biotite-hornblende granitic gneiss (Precambrian) locally pyroxeneic with subordinate amounts of leucogranitic gneiss. Amphibolites are locally present. Foliation strikes northeast and dips northwest.

Although gneiss has considerable strength and bearing capacity, weathering of the biotite, hornblende and pyroxene components of the rock as well as the amphibolites may yield rotted seams conducive to seepage.

There are no known faults or shear zones in the vicinity of the reservior according to the New York State Geologic Map (1970) and the Preliminary Brittle Structures Map of the New York State Geologic Survey (1977). The Brittle Structures Map does show a linear feature trending east-west which apparently follows the trend of Indian River east of the village of Antwerp. This linear feature appears to be either near or through the dam site. It may represent a fracture or fault, but is not indicated or shown on the New York State Geologic Map. If a fracture or shear zone does exist, it would be out of view beneath the river.

A shear zone trending northeast lies about 9 miles northwest of the dam according to the New York State Geologic Map. An extensive shear zone, about 2 miles wide and also trending northeast, is located about 10 miles southeast of the dam according to the 1977 Preliminary Brittle Structures Map. This map also shows another shear zone about 7 miles east-northeast of the dam and trending northeast.

Although the dam site is located in Zone 3 on the Seismic Probability Map, a Zone 2 designation would be proper. No earthquake activity has been recorded in the immediate vicinity of the dam. Between 1932 and 1963 five minor earthquakes were recorded from the Watertown area approximately 22 miles southwest of the dam site. None were of an intensity greater than III (modified Mercalli scale). An earthquake of intensity III was recorded from Alexandria Bay 18 miles to the northwest and another of intensity of VI had been recorded near Lowville approximately 34 miles to the south.

#### c. Data Review and Stability Evaluation

Information from the past relating to the as-built construction of the dam is limited to rough sketches of plan alignment and cross-sections from a field inspection report of 1914, a date that is a few years after the reported construction date. A field survey undertaken as part of this Phase I study has provided information on the present dam cross-section (Figures 2 - 4) but did not extend to determining properties of the dam materials and foundation rocks. Stability evaluations have been performed, utilizing the obtained cross-section information to obtain an indication of the dam's performance when subject to different possible loading conditions. In these analyses, some assumptions were required in regard to concrete and rock properties and the geometry of the dam cross-section.

The effects of a reservoir at the main spillway level along with ice affects, and a reservoir at the PMF level, have been studied. The results for these conditions are summarized in the following table. The analyses are included in Appendix D.

# RESULTS OF STABILITY COMPUTATIONS

	Loading Condition	Factor of S	Factor of Safety* urning Sliding**	Location of Resultant*** Passing through Base
(I)	Reservoir level at spillway elevation,			
(i)	(i) no uplift on base, no ice acting	<b>&amp;</b> ¹	;	
(ii)	(ii) uplift on base, no ice acting	2.8+	37+	0.46b
(111)	(iii) uplift on base, ice one foot thick acting	1.14+	12+	0.096
(iv)	(iv) no uplift on base, ice one foot thick acting	1.56+	1	
(11)	Reservoir level at 1/2 PMF elevation, uplift acting on base as computed for normal operating conditions.	7.8+	17.+	0.33b
(111)	Reservoir level at PMF elevation, uplift acting on base as computed for normal operating conditions.	1.75+	13+	0.37b
(IV)	Reservoir level at spillway elevation with earthquake forces acting (utilizing seismic coefficients applicable to Zone 3 Probability Area)	/ Area)		
(i)	(i) uplift, no ice	1.77+	{	0.36b
(11)	(ii) uplift, ice one foot thick acting	0.92+	:	

\*These factors of safety indicate the ratio of moments resisting overturning to moments causing, and the ratio of forces resisting sliding to those causing sliding; a ratio less than unity indicates instability. Upstream and downstream pool levels were obtained from HEC-1DB analysis.

<sup>\*\*</sup>As determined applying the friction-shear method.

<sup>\*\*\*</sup>Indicated in terms of the dam's base dimension, b, measured from the toe of the dam.

The analyses indicate unsatisfactory stability against overturning for certain combinations of loading.

Critical to the analysis and resulting indication of stability are the items of uplift water pressures acting on the foundation of the dam and the permeability of the foundation site's bedrock. The analysis uplift force was based on full headwater hydrostatic pressure acting at the dam's foundation upstream corner and a zero tailwater hydrostatic pressure acting at the dam's downstream corner, with the resulting triangular force pattern applied to 100 percent of the dam's section. The resulting uplift force represents a condition that is significant to the analysis in arriving at the computed low factors of safety against overturning.

The assigned uplift force is believed to be conservative but could be too severe if the dam is embedded in sound rock. The prediction of uplift acting on the base of a gravity dam founded on rock without information on the permeability and seepage properties of the rock stratum represents an analytical area of great uncertainty. If the rock is very sound and impermeable, seepage would be very low and uplift pressures of significance would require a long period of time to develop. A conclusion for such a condition is that the computed uplift may not exist at the present time, and only develop at some future time.

The analysis indicates instability could occur if the dam is subject to earthquake forces of magnitude. Though the reservoir area is grouped into a Zone 3 Seismic Probability location, a current geologic-seismic evaluation recommends a Zone 2 designation for the site.

Requirement for attention at this time includes proper repair of the masonry flume dam/spillway structural comprising the "separate" southerly section of the (total) dam to improve the structural integrity and to limit seepage.

#### SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

#### 7.1 DAM ASSESSMENT

#### a. Safety

- 1. At the southerly section of the dam near the south abutment, the wall is constructed of stone masonry. Leakage was detected at the foundation of this masonry section. This leakage was of a substantial quantity at the time of inspection.
- At the time of inspection, all the stop planks in the regulating weir were removed.
- 3. The entire structure was observed to be founded on bedrock.
- 4. There was no evidence of misalignment of the top of the spill-way or the dam.
- 5. The stability analysis shows that the dam is unstable under conditions of uplift, ice and seismic loading, with a factor of safety of 0.92.
- 6. The abutments of the dam should be inspected to evaluate erosion potential under high floods which would overtop the dam.
- 7. The dam is founded on bedrock and is located on top of a rapids area. A small low level overflow spillway has a capacity of 454 cfs. Considering this discharge to be the top of dam capacity, the dam can pass 1.0% of the PMF without overtopping. The 1/2 PMF overtops the dam by 4.4 feet and the Village bridge, crossing the Indian River, by 6.2 feet.

#### b. Adequacy of Information

- The sections of the dam were obtained from field surveys conducted while the spillway was operating under substantial head. There is no outlet in the dam to allow the dam to be drawn down.
- 2. The basin is ungaged and no flow records or information on high water levels were available to use to develop and calibrate the HEC-1DB model. High water mark data would have been of benefit in the Hydrologic/Hydraulic Analysis.
- 3. Topographic information at the dam site and in the Village was limited to USGS mapping data and the limited surveys in this report. More detailed information is necessary to evaluate flood flow characteristics at the dam site and in the Village.

# c. <u>Urgency</u>

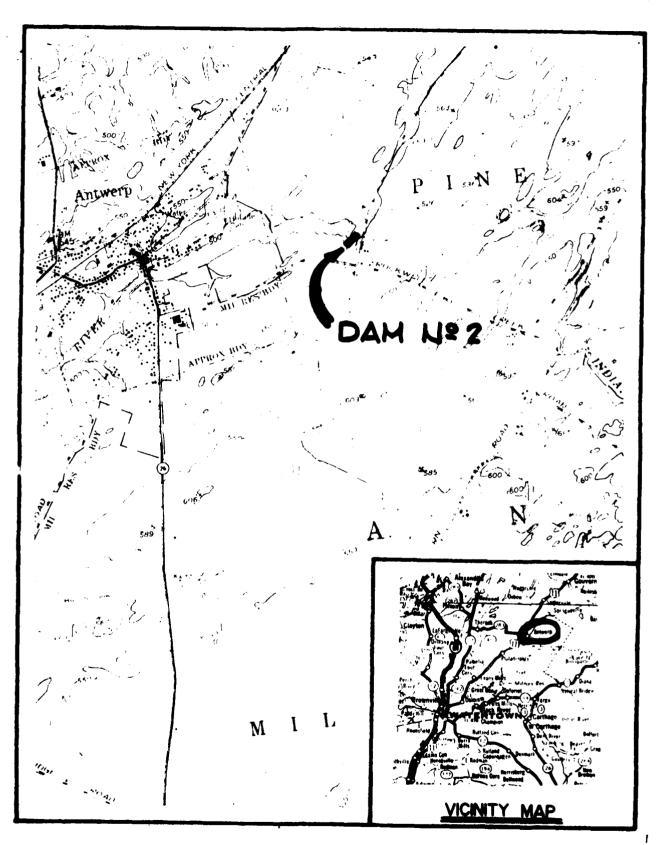
Further investigations regarding the dam's structural stability should be undertaken.

#### d. Need for Additional Information

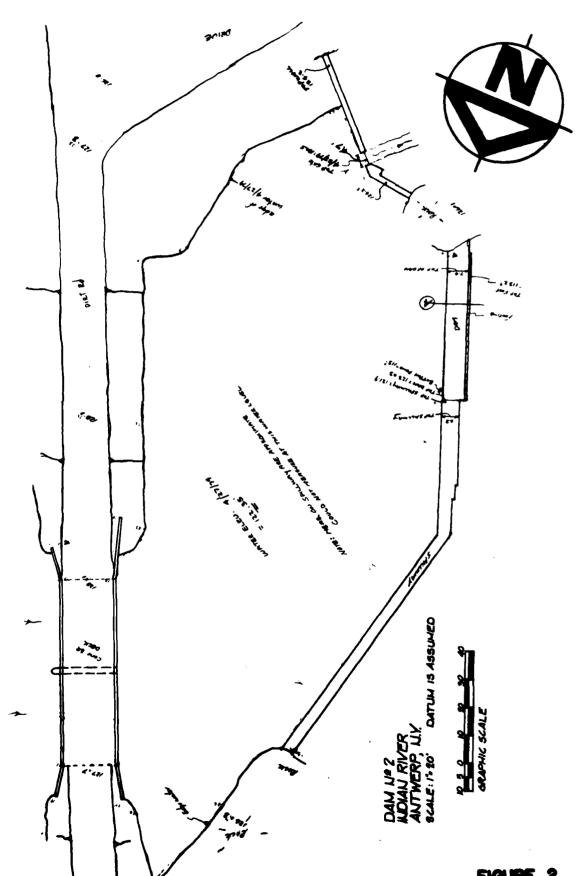
Additional topographic and hydrological data is necessary to complete the recommended investigations. Additional information on the dam cross section and foundation conditions are also necessry to properly assess the dam stability. The interrelation of the stability with the hydraulic computations are critical to the findings of this report. More accurate data in these areas could affect these findings.

#### 7.2 RECOMMENDED MEASURES

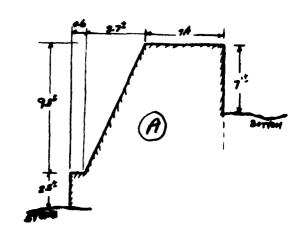
- a. Further investigation regarding the structural stability of the dam should be undertaken. This investigation should include the evaluation of hydrostatic uplift which may exist at the foundation interface and investigation of any tiedown elements which may be presently incorporated into the dam.
- b. Repairs should be made to eliminate seepage and improve structural stability at the south abutment of the masonry dam section.



LOCATION PLAN

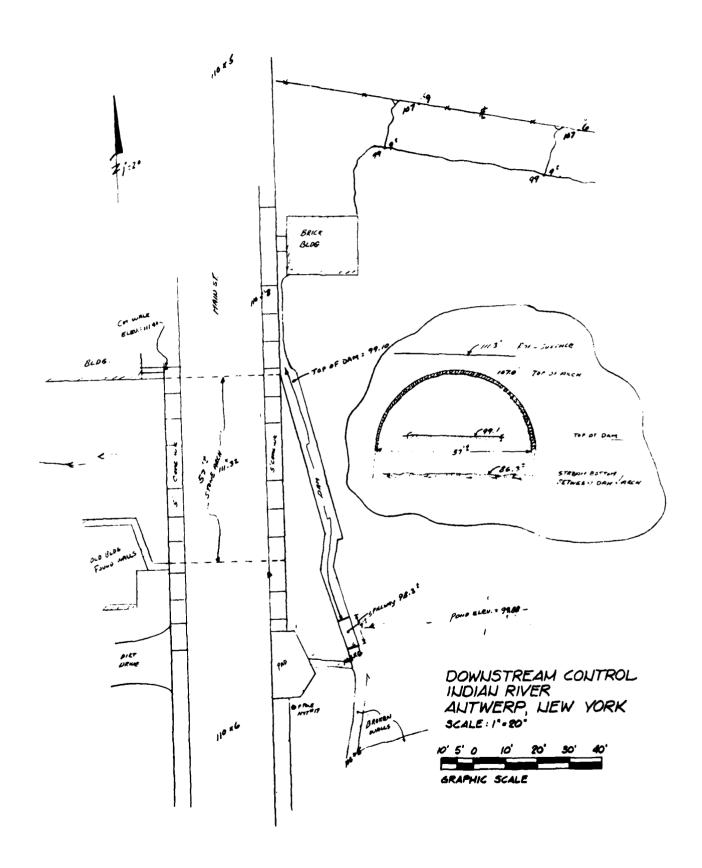


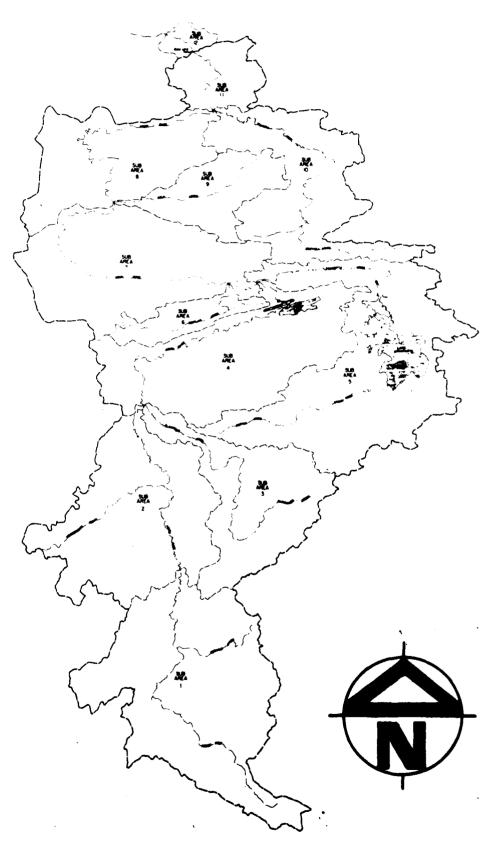
BRIDGE ELEVATION



DAM SECTION

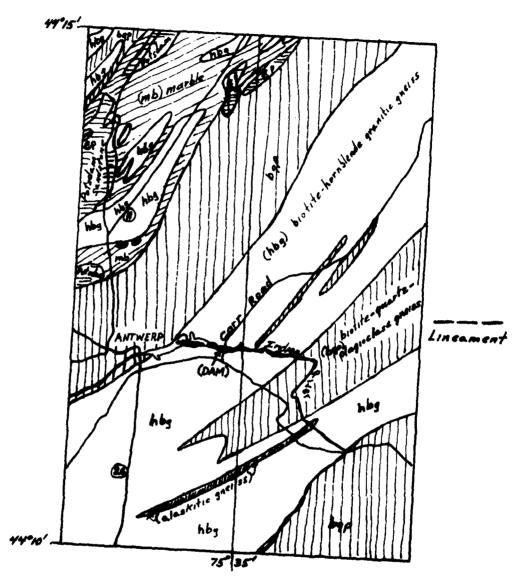
DAM Nº 2 - INDIAN RIVER ANTWERP, N.Y. SCALE: 1"= 20' DATUM IS ASSUMED





DRAINAGE BASIN PLAN

DOLDE 5



GEOLOGIC MAP

APPENDIX A
FIELD INSPECTION REPORT

CHECK LIST VISUAL INSPECTION

PHASE 1

tame Dam No. 2	Town: County	Town: Antwerp ounty Jefferson	State N.Y.	10 # 345
Type of Dam Concrete	I	Hazard Ca	Hazard Category Significant	
Mate(s) Inspection May 2, 1979	Weather	Fair	Temperature	
ool Elevation at Time of Inspection 122.4		M.S.L. Tailw	ater at Time of L	Tailwater at Time of Inspection Below Rapids

Inspection Personnel:

Stetson-Dale	Stetson-Dale	Stetson-Dale	
F. W. Byszewski	F. D. McCarthy	N. F. Dunlevy	

N. F. Dunlevy

Recorder

# CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Along south abutment at contact with rock foundation. Water at base of dam from spillway discharge.	Flow between base of masonry stone section and bedrock outcropping. Height of section -6 feet, length of seep - 10 feet.
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	See above description of seepage. Abutment is largely bedrock.	
DRAINS	None noticeable	
WATER PASSAGES	Stop plank service spillway exists near south abutment.	
FOUNDATION	None	

# CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS Concrete surfaces	None. Concrete in good condition.	Area water spillway looks in good condition.
STRUCTURAL CRACKING	None	Seepage in between bedrock and masonry contact.
VERTICAL & HORIZONTAL ALIGNMENT	Good Condition.	
MONOLITH JOINTS	None	
CONSTRUCTION JOINTS		
STAFF GAGE OF RECORDER		

### EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	N/A	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	N/A	
SLOUGHING OR EROSION OF EMBANKHENT AND ABUTMENT SLOPES	N/A	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	N/A	
RIPRAP FAILURES	N/A	

### EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
•		
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	N/A	
ANY NOTICEABLE SEEPAGE	N/A	
STAFF GAGE AND RECORDER	N/A	
DRAINS	N/A	

# UNGATED SPILLWAY

CONCRETE WEIR  Founded on bedrock. At time of inspection under 6 inches of wate head of Dam  APPROACH CHANNEL  Head of Dam  Head of Dam  On bedrock. Well graded, rapids.  No bridge on dam - a bridge crosses the reservoir 300 feet just upstream of dam.	Founded on bedrock. At time of inspection under 6 inches of water.
	Bridge crosses reservoir 300 feet above dam.
	11 graded, rapids.
	m - a bridge ervoir 300 feet f dam.

SHEET 7

(Stop Plank Operated Sluiceway)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Submerged. About 12-16 inch dis- charge.	
APPROACH CHANNEL	Head of dam,	
DISCHARGE CHANNEL	Rock spillway, well graded, rapids.	
BRIDGE AND PIERS	•	
GATES AND OPERATION EQUIPMENT	At time of inspection stop planks were all removed.	

## OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None	
INTAKE STRUCTURE	None	
OUTLET STRUCTURE	None	
OUTLET CHANNEL	None	
EMERGENCY GATE	None	

# DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Unobstructed flow, bedrock. Whole logs piled into channel, no obstruction however.	
SLOPES	Well graded, rapids.	
APPROXIMATE NO. OF HOMES AND POPULATION	Village of Antwerp homes on lake below dam. Hazard at residential and commercial structure adjacent to bridge in Village.	Structures parallel to lake are about 20 feet above spillway level. Structures normal to lake on street that bridges spillway is much lower and is a potentially high hazard area.

#### SHEET 10

## INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	N/A	
OBSERVATION WELLS	N/A	
WEIRS	N/A	
PIEZOMETERS	N/A	
ОТНЕЯ	N/A	

### RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Flat terrain adjacent to reservoir.	
SEDIMENTATION	Unknown	

	CHECK LIST	F DAM	Dam No. 2
DESI	DESIGN, CONSTRUCTION, OPERATION  PHASE 1	l	345
ITEM	REMARKS		
AS-BUILT DRAWINGS	None		
REGIONAL VICINITY MAP	See this report.		
CONSTRUCTION HISTORY	Unknown		
TYPICAL SECTIONS OF DAM	See information prepared for this report.		
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	No data.		
RAINFALL/RESERVOIR RECORDS	No data.		

ITEM	REMARKS
DESIGN REPORTS	No data.
GEOLOGY REPORTS	No data.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	No data.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	No data.
POST-CONSTRUCTION SURVEYS OF DAM	See information prepared for this report.
BORROW SOURCES	No data.

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	No data.
HIGH POOL RECORDS	No data.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	No data.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	No data.
MAINTENANCE OPERATION: RECORDS	No data.

ITEM	REMARKS
SPILLWAY PLAN	No data.
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	No data.

\*

the make the m	A CONTRACTOR OF THE CONTRACTOR
April 10 miles	
******	
•	Applications of the second of
<b>.</b>	Lengt- I-1 fee!
€. f.	Number and Type of Gates Stop log sluiceway (logs not in place)
• OUTLET W	ORKS:
a.	Type Stop logs sluiceway mentioned above.
b.	Location South abutment area of dam
c.	Entrance Inverts
d.	Exit Inverts same
е.	Emergency Draindown Facilities
HYDROMET	EOROLOGICAL GATES:
а.	Type None
b.	Location None
c.	Records None

APPENDIX B

PREVIOUS INSPECTION REPORTS/RELEVANT CORRESPONDENCE

(NOTICE: After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany., CONSERVATION COMMISSION DAM REPORT Lept. 2/, 1914 Conservation Commission, DIVISION OF INLAND WATERS. GENTLEMEN: I have the honor to make the following report in relation to the structure known Sterlings This dam is situated upon the Judian River in the Town of autwerpe, Jellerson County, about 14 miles from the Village or City of Authoria The distance up stream from the dam, to the Attalingburg Bridge, is about 60 feet.

(State strance) The dam is now owned by W.A. Brooker, Philadelphia H. and was built in or about the year 1885, and was continued and during the year 1912. As it now stands, the spillway portion of this dam is built of coursell and the other portions are built of coursele and sto a As nearly as I can learn, the character of the foundation bed under the spillway portion solid rock and under the remaining portions such of the dam is

foundation bed is solu

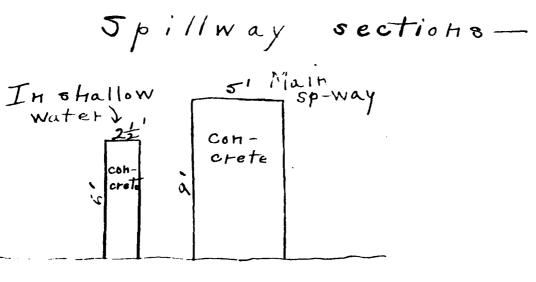
#### NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION DAM INSPECTION REPORT (By Visual Inspection)

Dam Number	River Basin	Town	County	Hazard Class*	Date & Inspector
345	Oschie	Antwerp	Veftersin	, , , , , , , , , , , , , , , , , , ,	15/28/15 6
	Construction			Use	
	/concrete spillw /drop inlet pipe	ау		☐ Water Sup	bıà
	stone or riprap	spillway		Recreation	n
Concrete	•	. ,		Fish and	Wildlife
Stone		Farm Pond			
Timber				No Appare	nt Use-Abandoned
Estimated	Impoundment Size	a	Estimata	ed Height of Dam	shove Streamhed
	-5 acres	<b>-</b>			10 feet
5-	-10 acres			10-25	feet
<b>⋈</b> 0√	ver 10 acres			Over 25	5 feet
		Condition	of Spillway		
Service	satisfactory			Auxiliary satisfe	actory
In need	of repair or ma:	intenance		In need of repair	•
Explain:	:				
	<del></del>				
	Condi	tion of Nor	-Overflow Se	ection	
Satisfac	-	·,			•
In need	of repair or mai	intenance	Explain: _		
<del></del>	<del></del>				·
	Condi	tion of Med	chanical Equi	nment	
☐ Satisfac	tory None	teron or nec	Manifear Equi	pmerre	
In need	of repair or mai	ntenance	Explain: _		
<del></del>					
	Evalua	tion (From	Visual Inspe	ction)	
		⊠ No def	ects observe	d beyond normal m	aintenance
				eyond normal main	
*Explain Haza	ird Class, if Ne	essary V	ext old	dan Mil	
					B-2

		ENVIRONMENTAL TION REPORT Inspection)  County Ha	conservation  zard Class*	Date & Inspector 5/22/75
	Stone		Use Water Suppower Recreation Fish and Water Farm Pond No Apparen	ply 1
	1-5 acres 5-10 acres Over 10 acres	Estimated He	Under 1 10-25 f	feet
	Condition Service satisfactory In need of repair or maintenance Explain:	7.34	liary satisfa	actory or maintenance
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	n-Overflow Section Explain:	<u>n</u>	
	Condition of Me Satisfactory In need of repair or maintenance	chanical Equipmen	<u>t</u>	
1 *Ex	No de	Visual Inspection fects observed be required beyon	yond normal mair	ntenance

6-3

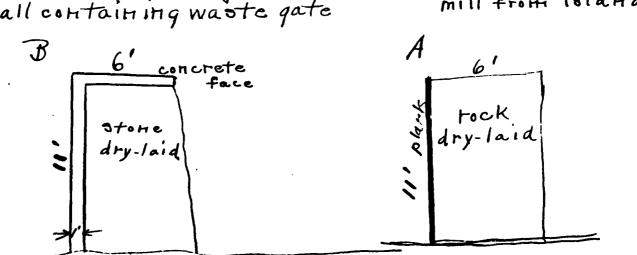
(In the space below, make one sketch showing the form and dimensions of a cross section through the pidway or waste-weir of this dam, and a second sketch moving the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)



(In the space below, make a third sketch showing the general plan of the dam, and its approximate position in relation to buildings or other conspicuous objects in the vicinity.

Section through 30' wall containing waste gate

Wall actors to mill from island



The total length of this dom is . /55 feet. The spillway or waste-
weir portion, is about . For a leet long, and the crest of the spillway is
about feet below the top of the dam.
The number, size and location of discharge pipes, waste pipes or gates which may be
used for drawing off the water from behind the dam, are as follows: One waste
gate o'deep and 2 = wide (see general view.)
State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks which you may have observed.)
This dam is in good condition and dres not leak.
·
Reported by CW. N. Douglass,
(Address -Street and number, P. O. Box or R. P. D. route)
(SEE OTHER SIDE)

Indian R. Sterling Warg Brilge bed tock, Corresponding to the series 5p-.vay bed rock bed tock APPENDIX C

HYDROLOGY AND HYDRAULICS

#### STETSON • DALE BANKERS TRUST BUILDING DESIGN BRIEF TEL 215-797-5800

BUBJECT	ESTIMATE OF TO = 11.9 (L. SUB AREA	TE OF CLARK  DF TC  L 3/H) . 385  L (M1)  1 13.598  2 7.670  3 10.417  4 8.712	TWERP) FORT  S PARAMETE  H (FT)  415  178  178	RS ASSUM TE 4 R 23.81 17.02		
	ESTIMATE OF	1 13.598 2 7.670 3 10.417 4 8.712	<u>H</u> (FT) 415 178 178	Assum TE & R 23.81 17.02	ne: R/(Tc+R) =	
	TE = 11,9 (L SUB AREA	L <sup>3</sup> /H). <sup>385</sup> L(M) 1 13.598 2 7.670 3 10.417 4 8.712	4 5   178   78	TZ 4 R 23.81 17.02	· · · · · · · · · · · · · · · · · · ·	
	SUB AREA	1 13.598 2 7.670 3 10.417 4 8.712	4 5   178   78	<b>2</b> 3.81 1 <b>7</b> .02	R=Tc ¥	ŧ
	SUB AREA	1 13.598 2 7.670 3 10.417 4 8.712	4 5   178   78	<b>2</b> 3.81 1 <b>7</b> .02		
	11 11 11 11 11 11 11 11 11 11 11 11 11	2 7.670 3 10.417 4 8.712	178 178	17.02		
	10 00 00 00 00 00 00 00 00 00 00 00 00 0	3 10.417 4 8.712	178			
	10 00 00 00 00 00 00 00 00 00 00 00 00 0	4 8.712		24.05		
			n.e	24.25		
			215	18.34		
		5 14.394	215	32.75		
		6.004	125	14.70		
		7 9.091	155	21.85		
		7 9.091 8 8.475 9 5.682	. 95	24.33		
	11	9 5.682	90	15.65		
	н 1 н	10 15,379	255	33.11		
	H H	11 2.652		6.03		
	$\mathbf{n}^{\prime} = \mathbf{n}^{\prime}$	12 .871		1.72		
		•		, -		
	<u>SC5</u>	1.8 /- 1.7		•		
	L = <u>x</u>	900 Y.5	Tc= 4.6	5 = 1000 - 1	0	
	, , , , , , , , , , , , , , , , , , ,	<u> </u>	5 Y (%)	) <u>L</u>	TC & R (Hes)	
	SUB AREA	1. 7/800	4.706 4	6.832	11.39	
		2 40500	4.286 3	4.730	7.88	
	. h	3 55000	4.704 3	6.374	10.62	
	, p	4 46000	4.286 3	5. 237	8.73	,
		5 76000	4.286 5	6.062	10.10	į
	tt H	6 31700	3.889 3	3.681	6.14	• •
	H 31	7 48000	3.889 3	5.130	8.55	
1	te a	8 44750	4.493 3	5.262	8.77	•
	i hi n	9 30000	4	3.924	6.54	
•	i ti. di	10 82000		7.874	13.12	
•	h n	11 14000		1.650	2.76	
1 .	;	12 4600	3.889 4	.481	1.13	Cal
	i .	7000		.401	1.15	41



PROJECT	NAME <u>NEW</u>	YORK	STATE	DAM 1	NSPECT	TION			DATE 5.7.79
SUBJECT	DAM	Nº 2	(VIC A	NTWER	e) FOR	T DA	RUM, NY		_ PROJECT NO. <u>227</u>
	EST	MATE	OF SNI	IDER'S	PARAM	1ETE	RS	<del> </del>	- DRAWN BY
	640 CP					<u>t</u>	0= C+ (L.	Lca).3	
•	CP 15					,		,	4
	508	AREA .	1 THRU 12	_		<u>ح</u>	Lan	Lea (mi)	te
				วบุธ	AREA 1	2.0	13.598	3.69	6.47
				**	2	20	7.670	3,31	5.23
				<i>p</i>	3	2.0	10.417	4,45	6.32
				jt	. 4	20	8.712	3.13	5.39
			•		, 5	2.0	14.394	7.29	8.08
				11	, 6	2.0	6.004	1.80	4.08
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					<u>"</u> 9	2.0	5.682	3.03	4.70
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PROJECT NAME			5479
WOJECT	DAM Nº 2 (VIC ANTWERP) FORT DRUM, NY		
	CALCULATION OF WEIGHTED CH	DRAWN	w <u>JPG</u>
Sue	B AREA 1		
	$83 \times 10 = 830$		
-	66 x 90 = 5940		
	6770 +100 = 68		
<u>Su</u>	B AREA ?		
	83 x 22 = 1826		
1 . 44	66 x 78 = <u>5148</u>		
	6974 ÷ 100 = 70		
	18 AREA 3.		
1	83 x 14 = 1162		
: . •	66 x 86 = 5673		
	6838 ÷ 100 = 68		
	18 AREA 4		
•	83 x 21 = 17 45		
· · ·	66 x 79 = 5214		
	6957 + 100 = 70		
<u>.</u>	B AREA 5		
	83 x 23 = 1909		
	66 x 77 = <u>5082</u>		•
	6991 +100 = 70		,
5.	UB AREA 8		
	83 x 15 = 12 45	•	
	66 x 85 = 5610		
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	66 x 90 = 5940		•
	6770 ÷ 100 = 68		C·3



PROJECT NAME	HEW YORK STATE DAM INSPECTION	DATE 5.3.79
BUBJECT	DAM Nº 2 (VIC ANTWERP) FORT DRUM, NY	PROJECT NO 2277
	DEPTH - DURATION RELATIONSHIP	- DRAWN BY JPG

#### HYDROMETEGEOLOGICAL REPORT Uº 33

PMP INDEX RAINFALL 200 SQ MI 24 HR - 185"

QURATION	<u>%</u>	DEPTH
 6 HR	85	15.73
 12 HR	97	17.95
24 HR	105	19.43
48 HR	120	22.22

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DAM NG 2 (ANTMERP) HEC-1DB PMF-DAM OVERTOFFING ANALYSIS

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#ULTI-FLAN ANALYSES TO SE PERFURMED VELAN= 1 NATIO= 0 LRTIO= 1 C.40 C.5C C.4C T.00

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### SUE-AREA RUMMER COMPLIATION

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1:UT0 0 ISTAGE 0 INAPE JPL 1 0 ITAFE CLAMK'S FARAMETENS ICCAP IECON II O O LANK ICCPP 0 SUB AREA 1 AUNOFF ISTAG

LOCAL ISAME 1 SN C M kA11C C.0CC TRSDA TRSEC 152.10 0.00 HYDROLPER! DATE SNAF O.CC 1 A K E A 3.02 10:01 0 IMYDu 1

896 (.08 £72 €.6€ PRECIP DATA RTZ RZ4 R48 Sreat 1.55cm 12000 2 & C. SPEC CONTUTED BY THE FRICHAR IS G.E.??

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41. 36.	RAIN EXCS LESS		****	SUB-A	S RUNOFF ISTAG ICCMP 3 5 5	TUNG TAREA SNAP U 11.63 U.LL	SFFL F#S R. C.CC 10.5C 5.0C / 15 0.8/?	0LTKR KT10L ER	Un TC= 16.02	STRTU= 24.CC	RALS ENE-OF-LERI, D 165. 165. 370. 144. 131. 50. 51. 27. 27.
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L M.-DA HK.-% PERIOD RATY EXCS 175S COMP. 4 MC.DA HR.MM FEKIOD RAIN EXCS LOSS COMP.6

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NORMAL DEFTE CHANGEL ROUTING

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.0260	.KD1%ATES 156.65 970.00	146.25 9513.76	515.21 ,2551.11	606.32 695.47	315.21
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	IMYDG	1 1 1 1	TAREA 17.37	SNAF U.CC	HYBROUR TRSDA 152.10	HYDRUGRAPH DATA TRSDA TRSEC 152.10 G.C.	FAT10	NONSI	ISAME	J TOCAL	
RSPC CCYUTED BY THE	SEFT FAS U.C. 18.50. 15.50. 15.	SFF: U.O.: IS C.E	FMS 18.56	34.6.	FREC1 R1c 97.00	FRECIP DSTA 81c 824 97.00 1 3.00	848 146.00	R72 6.00	896 (1.00)		

TRKE SLIKE FILL FRAIL STRES KIJOK STRIL CNSTL ALSMY FILEF Gebe teol leg legt see legt legt Cell Gel	TO A TO THE DATA TO THE TANK T
STRKP OL	
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FECESSION DATA 24.5 STRT0=

736. 234. 74. 24. 7.
VOL= 1.:C 4C2. 262. 85. 85. 86.
CP= C.57 E15. 294. 294. 30.
7.58 HCURS. 768. 330. 105. 33.
Sr LAC= 7. (73. 370. 117. 37.
2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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1411 EYDROGR 174. 565. 1ce. 57.
0.3 0.50 267 267 267

COMP C L055 O END-OF-ERIOD FINAL EXCS LISS UND ACLDA PRIMA FERIOD RAIN EXCS

50F 19.46 15.78 5.76 178062. (454.)(359.)(95.)(5042.15)

SUB-AREA RUNDEF COMPLIATION

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LOCAL ISAME NONS I KAT10 C.000 HYDRUCKAPP DATA SNAF THSDA TRSEC C.(C 152.1C 0.CC 148EA ອ**:n** ວ IMYDG 1

896 C.UU 872 C.Ci | PRECIF DATA | R48 | R4 SPFE FMS L.(\* 12.5c TRSPC COMFUTED BY THE PROGRAM IS 0.877

87119 0.00 LUSS DETA DLTKR PIIOL ERAIN STRKS RIIOK STRTL CNSTL ALSMX 5.50 1.50 6.50 0.00 1.00 1.00 0.10 6.00 STRKE U.LE LROPT

UNIT HYLPGUKAPH DATA IC= 10.10 R= 10.10 NTA= C RECESSION DATA STRIGE 44.00 RIIOR= 1.00

798. 309. 1115. 43. 2.0 2.0 2.0 2.0 2.0 1.4 1.4

9 dw00 END-OF-FERICO FLOW
LUSS COMP G MOLDE HRIMA PERIOD RAIN EXCS LOSS MR."N PEFIUD HAI'S EXCS 40. . P

50\* 19.46 15.76 3.76 200619. (494.)(394.)(95.)(5680.89)

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COMPENS HYDE GRAFHS

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NORMAL DEFTH CHANNEL ROUTING

3000 B. 1061 FL GTH 14(2) GN(3) ELNVT FLMAX + 14cc + 12cc ۲۷(1) . 1.80 i.

562.33 32496.41 284678.25 695.74 718.16 32496.41 284678.25 439.79 23401.45 23411.45 47408.47 97.89 334.17 16082.39 714.47 16032.35 CROSS SECTION COURDINATES—STANELEVASTANELEV—ETC 106-00 720.00 150.00 710.00 375.00 700.00 450.00 655.00 500.00 685.00 1000.00 700.00 1500.00 710.00 1550.00 720.00 2126.20 163/2.39 180197.00 103:2.39 18:197.60 654.21 6136.61 156425.88 101.75 1837.14 056.31 151.422.82 3170.45 3177.43 98-44 1555-96 66...23 76...25 12×6.71 150527.62 51.21 268.c3 717.16 1256.71 1.1501.62 16.64 311.47 2,5.21 511.85 1.65231 .u. 27.5.15 0.01 61577.06 555.08 753.42 3.6 STABE FLC. UNIFLUA STURAGE

2.360 MAXINUP STAGE 15

1.560 MAKENUM STRUE IS

2.360 SI JOYLS EDGENE

3.14.0 VANITOR CTANE IS

32350. 917.18) COMP 120. 24. 5. SU\* 19.46 15.70 3.76 (494.)( 95.)( 1055 1 - U 10 FULDA HE.MS PERIOD PAIN EXCS 7 0 C A L JPRT INAME ISTAGE A L SP X C . C C ISNOW ISAME 896 C.00 C & S T L C . 1 C \*\*\*\* c.6u R110R= 1.00 R72 C.00 LOSS D.TA
CLIKK KIIGL LEAIN STRKC RIIGK STRTL
G.OC 1.CL C.GC U.OC 1.50 1.00 84710 C.00C MIA= ( FRECIF DATA R12 K24 .R48 97.00 15.00 126.00 SUB-AREA RUNAFF COMPLIATION JFLT S UMIT MTCROGRAPH CATA TC= 6.14 H= 0.14 MI C END-OF-FERIOD FLOW A SEND-OF-FERIOD FLOW A SENDO FLOW A FREIOD PAIL FXCS L SS COMP A FULD HYDROGRAFF DATA SNAF TRSDA TRSPC C.CC 152.1C 0.CC RECESSION DATA 0.CC GRCSN= 0.C \*\*\*\* ICUMP IECON ITALE CO. SPEC PMS RC C.OC 18.5C ES.CC TRSEC CURENTED BY THE PROGRAM IS C.6.77 \*\*\*\* STFTG= IUN D TAREA C 3.10 SUB AREA 6 PUNOFF STAKE U.CC 1476. 7.0.7 ( KOF I MAXIMUM STAGE 15

COMOTAE NYDE OPAFRS

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JERT INAME ISTACE TIETO ILLUA ITALE JILI GOVET'S LOPINGEARING AT 4 ISTAGE TO NO.

7.554

MAKINUM STAGE IS

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COMPARE MUTE THRU MEEM / ISCOM ITAFE JFLT JFRT INAME ISTAGE 10010	148U A1 15146 5	EM / ICLMP	1ECON	3 1 4 1	JPLT	JF RT	N P B E	ISTAGE	1-610
0.05 CLUSS CLUSS	CLUSS U-UUC	AV5	ROUT IRES 1	ROUTING DATA IRES ISAME LOFT	7 40	1 F F D	-	ראדא נ	)
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WORMAL DEFTH CHANNEL ROUTING

ELM/A RENT! S:L CRESS SECTION CLUBDINATES—"STANELEVYSTANELEV—ETC 1, or overly South of the 45cm, 6, or A2 5.0, or over 6 65f.60 after 0 field of agreen F1 NVT 595.L 6 (1) JN(2) GN(3) Greate 0.6400 0.0866

00.136 55.00

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1864.8C 5278.86 124c6.C4 65337.EE 605.53 12466.C4 65337.E8 1530.22 7.51.10 9.50.19 9,90.19 (17.37 1226.35 36.75.56 56155.86 602.c5 616.(5 7-177.90 50135.ed 43514.75 953.33 4954.60 6' 1.5c n14.74 711.02 4731.72 3126.81 6(6,20 3126.61 447.2. 595.75 1855.00 1853.40 32545.11 3C7.0t 3522.04 75.6.42 597.62 386.40 141.64 23354.71 271.93 23534.71 550.30 5.Ui 2640.25 17551.65 17.11.25.41 545.0° STALE STURAGE OUTFLU, , ,

CANINUE STAGE 15

ر. د. د AAIMUM : IFue 15

1.70 \* . . . SE STAUS STAILS 15 PARIOUP STALL IS

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### SUR-AREA RULLIFF COMPLIATION

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				HYDROG	RAPI. DAIA					
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				FREC	10 CATA					
SPFE PM	SPFE	Pas			R12 R24		2 Z H	3. 3. 3. 4. 6.		
	ر ن• ر	16.51	25.00		1.5.00	146,00	0.00	00.0		

71 S#X CNSTL C.1C \$3871 1.00 7.10X LOSS DATA ERATY STRKS P. C.80 L.20 8716L 1.00 ELTKR C.OC STRKE L.L. L 40PT

STRIG=

224. 224. 69. 21. UAIT HYDROGRAPH S. END-OFFERRICO CHDINATES, LACE 7.8C HTCLRS, CP= L.57 VOL= 1...C 12... 250. 467. 541. 452. 775. 203. 251. 57C. 5...C. 451. 4.1. 357. 316. 203. 251. 17... 15... 14. 111. 54. 28. 72. 55. 49. 43. 34. 31. 77. 64. 

0 4600 END-OF-FERIOD FLOW

"NALTH EXES 10SS COMP of TODA HR.MA FERIOD RAIN EXES LOSS 

19.4( 15.2( 3.7t 174869. (494.)(539.)(95.)(4951.73) 50.4 19.46 15.70

SPE-AKEA RUNCEF COMPLIATION

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ISTAG ICTPT TECON TTATE JELT JERT INAME ISTAGE TAUTO NUB AREA V RIBUFF

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					236. 51.	1055	3.76	:
n Pocal		RIIMP C.i.C			L= 1.LC 275. 59. 13.	EXCS	Sum 19.46 15.70 3.76 61564. ( 494.)( 399.)( 95.)( 1745.3C)	
SAME L	₽ <b>.</b> 6	ALS#X C.CC			6.57 v0 21. 69. 15.	R A I A	19.46	
ISNOW ISAME	R72 C.GU C	CNSTL C.1C		RIIOR= 1.CO	UNIT HYDROGRAFH 35 END-OF-FERICD ONDINATES, LAC= 5.91 HCURS, CP= 6.57 VOL= 1.LC c+	FERIOD	¥∩s	
KATEO	848 120.00	SIRTL 1.00	NIA NIA= C	RIIOR	5.91 HOL 36.3 17.	A . M.		•
	ATA R24 5.00 12	1A R110k 1.00	AFH DATA	0AT# 12.CU	372. 372. 94. 20.	73*04 #074 gr		:
HYDRUGHAFF DATA TRSDA TRSPC 152.11 C.L(	PRECIP DATA R12 R24 97.00 1.5.00	LOSS DATA STRKS G.OU	UNIT HYDROLKAFH DATA 54 R= c.54 NIV	RECESSION DATA QRCSN= 12.CU	334. 334. 116. 24. 5.	END-UF-IERIUD FLOW C MP G PO.EA		***
SNAF	8.6 23.65	ERAIN C.OG	٠,		FERICO C 262. 128. 28. 6.	END L.SS C		
TAREA C. (.t.	PHS *SC	R RIICL	1 C =	STRTG= 12.CC	35 END-OF	FXCS		***
10+01 1	SPFC C.C.	OLTKR C.OL		3,	1688FH 55	RAI		*
IHYDU	4.R.1.G.R.A.M.	STRKA U.O.			11 HYDROG 06- 174- 38-	FRIVO		:
	SPFE C.C. 18 TRSPC COMFLIED OF THE PROGRAM IS C.877	LROPT			263. 263. 44.	MK.TR (FRIDD		***
	3E 14WJ					) 40		
	TRSFÜ							

COMBINE PYDRIGRAFHS

JERT INAME ISTAGE IAUTO
0 1 C 0 \*\*\*\*\*\*\* 111 16CON 173FF \*\*\*\*\*\* COMEINE S HYDROGRAPHS AT S ISTAG TOURF 5 \* \* \* \* \* \* \* \* \* \* \*\*\*\*\*\*\*

PYDESTRAFF ROUTING

INAME ISTAGE JAUTO L S T R C JFRT 1 F P F IECON ITAFE JELT
O U U
HOUTING DATA
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1 1 1 0 **Αν**ι, α.ίς CHACKEL ROUTE TAKE AREA C 15734 1C.MP 9 ) 1 \* 9 9 \$ 1 1 1 9 7°7

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ISTRAI STCRA-1. . SK 0.000 x 0-0-0 AMSKK U.LCO ر س NSIEL NS 11 5

NORMAL DEFIN CHANNEL ROUTING

ELMAX RLNTH SEL 600.C 44750. U.LUD7C ELNVT 565.C 9N(1) 4N(2) 4N(3)

CROSS SECTION CCGRDINATES -- STAVELEV/STAVELEV--ETC 180.00 aC0.00 2CL.0C 59C.0C 35C.0C 55C.00

69-66 7725.47 8811.04 1396.85 1972.66 2618.57 3316.58 13795.21 13.65 13.65 13.795.21 13.65 13.65 13.795.21 13.65 1		860.0c	800.0c 580.cc	850.00	30.326 30.366	30.006	5 o C . 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$56.00 5f C.00 565.00 7tc.00 565.00	265.00	260.00	565.00		
L.UL 500.74 1530.22 3730.04 0232.07 9355.05 13119.14  565.05 560.84 568.6E 570.53 572.57 100367.95 1  565.07 565.26 567.10 588.95 590.79 590.70 590.70 560.70 1  576.05 560.74 1836.22 3730.04 6232.67 9355.65 13119.14  576.05 576.05 100367.95 100367.95 100367.95 1	STCRAGE	50 <b>29</b>		467.52	873		1396.85	1978.	26 26	618.57	3316.58	4172.68	4886.88
55.00 5 5 6 . 84 5 6 . 6 . 570.5 5 7 2 . 5 7 4 . 2 1 57 6 . 6 5 3 . 4 2 5 5 5 2 6 6 5 5 7 . 1 6 3 6 . 5 6 . 7 5 5 6 . 6 5 6 . 7 5 6 6 5 5 6 . 7 5 6 6 5 5 6 . 7 5 6 6 5 5 6 . 7 5 6 6 5 5 6 . 7 5 6 6 5 5 6 6 6 . 7 5 6 6 5 6 6 6 5 5 6 6 6 5 6 6 6 5 6 6 6 5 6 6 6 5 6 6 6 5 6 6 6 5 6 6 6 5 6 6 6 5 6 6 6 5 6 6 6 5 6 6 6 6 5 6	OUTFLOA	37141	•	500.74	1830 54939		3730.04	6232.		355.65	13.19.15	17547.56	16617.7; 22661.CS
560.74 1836.22 5730.04 6232.67 9355.65 13119.15	STAGE	565 583	245	5c6_84 5c5_26	5¢8 5°7		\$76.53 \$88.95	572.		574.21	576.65	113772.08	127989.44
573.9	FLOW	37141		566.74	1836,		\$730.04 \$734 \$5	6232		355.65	594.47	15.545.56	598.16
	AXIMUM ST.	AGE IS	\$73.9				•	. 3776.		76-477	100367.95	113772.08	127989.44

o 4

570.4 580.1 581.0 564.6 MAXIMUM STAGE 1S MAXIFUR STAGE 15 MANIPUP STAGE IS MAXIFUR STAGE IS

SUB-AREA RUNCFF COMPLIATION

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3.200

MAXINUM STAGE 15

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1.010 0 INAME ISTAGE **1** F R 1 JFL1 0 ICCMP IECON ITAFE JSTAG 8 SUE AREA & RUNNFF

LOCAL I SAME I SNU RATIC C.OCC HYDROHAFI DATA SNAY TRSGA TRSFC 0.CC 152.1C 0.CC 14REA 11.70 **л**ия6 С INY Do

PRECIF DATA

112. 131. 131. 131. 131. 131. 131. 131.
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NIA: 15.12 11:11

RECESSION DATA

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	VOL= 1.[C 372. 283. 132. 62. 29.	6.	EXCS
	CP= 0.58 329. 306. 143. 67.	4 K	Z   Y   Y   Y   Y   Y   Y   Y   Y   Y
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RTIOR= 1.00	21 HCURS 278. 35C. 154. 72.	3	2 E •
28.00	223. 223. 35c. 160. 77. 36.	00 1 1 00 1 00 1 00 1 00 1 00 1 00 1 0	4
ORC SN=	10D GRDINATES, LAG= 12.21 HCURS, CP 170. 223. 278. 554. 554. 550. 179. 160. 154. 77. 72. 59. 59. 55.	8. 8. 4. 6. END-OF-PERIUD FU	, LEO
28.00	-FERIOD 120. 414. 194. 90.		
STRTG=	10. 37. 75 END-OF-FERIOD OR 25. 414. 255. 269. 194. 105. 97. 90. 90. 90. 90. 90. 90. 90. 90. 90. 90	5	
	RAFL	<u>.</u>	:
	437. 437. 225. 105.		•
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	266. 266. 113.	7	•
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			COMBINE	OMBINE HYDRUGRAFHS	FHS				
CUMPIVE S	CUMPINE 3 HYDROURAPHS AT 6 ISTAG ICCPF 3	S AT 6 ICCPF	IECON	YDROGRAPHS AT 6 ISTAG ICCPF IECON ITFFE JILT JFRT INAME ISTAGE 1FUTO 6 3 0 0 0 1 C	1111	JFRT	INARE	ISTAGE	17UTO 0
****	***	:	# #	****		* * * * * *	*	•	* * * * * * * * *

SUM 19.46 15.70 3.76 138862. (494.)(599.)(393.13)

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HYDROGRAPH ROUTING	ITAFE O ING DATA	ISAME	AMSKK U.CLU
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	TE TERU I ISTAG	00000	NSTPS
	CMARGEL ROUTE THRU AREA 11 1STAG ICHPF 7	0°0 85070	

MCRMAL DEFTH CHANGEL ROUTING

ELMAX RUNTE SEL 536-0 14060- 0-00400 214.C 4.(1) 34(2) 98(3) 0.0800 0.0400 0.0800

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110.00 530.00 250.00 525.00 400.00 520.00 525.00 514.00 600.00 514.00 914.00 910.00 514.00 514.00	28.37 72.88 135.55 21C.32 3C3.25 412.33 537.55 677.09 1164.20 1549.55 1545.95 1753.85 1973.19 2203.92 2446.05 2699.57	156.9£ 542.05 1356.75 2517.03 4124.25 6234.65 8c99.94 12813.69 28502.35 35052.5€ 42165.3£ 49964.41 58274.00 67279.36 76926.19 87226.77	514.84 515.6k 516.53 517.5/ 518.21 519.05 519.89 520.74 -523.2c 524.10 524.95 525.79 526.63 527.47 528.31 529.16	156.9C 592.C5 135c.73 2517.O3 4124.25 6234.65 8859.94 12813.69 28562.35 35052.5C 42165.36 499C4.41 58274.0C 67279.36 76526.19 87220.77	52L."	522.5	523.4	524.3	7,656
0.00 250.00 525.0 0.00 1660.00 525.0	28.37 1164.20 1	156.90 28562.35	514.84 -523.2c	156.9C 28562.35	\$26.4	526.5	523.4	524.3	7.656
110.00 5501104 to 1.00 7 10.00	STURAGE 9952.43	0.017FL09 22692.66	STAGE 514.00	FLU. 22692.66	MAAIPUM STAGE IS	MAXIMUM STAGE IS	MAXIMUM STAGE IS	MAXIMUM STAGE IS	MAXIMUM STAGE IS

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MAXIMUM STAGE 15

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				PREC	IP SATA					
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10.50	<u>ر</u> د .	13.50	7.00		1 5.511	166.06	ر د د			

UNIT HYDOGRAPH DATA

TC= 2.10 R= 2.10 NIA= C

6717FF 0.1C

ALSPX C.CC

CASTL C.16

LOSS DATA
RTICL ERAIN STRKS RTIUK STRTL
1.CL C.07 J.CL 1.0C 1.0C

CLTKR 1-0-1

STRKR 1.64

LROFT

	RTIOR= 1.00	1
DATA	. ŭŭ.	
RECESSION DATA	QRCSN=	
	8.i.C	
	STRIGS	

UNIT HYDRUWRAFH 16 END-OF-FERIUD GRDINATES, LAG= 2.5k HCURS, CP= 0.58 VOL= 1.(C 404. 557. 468. 325. 225. 156. 108. 75. 25. 17. 12. 8. 6.

SUM 19.46 15.70 3.76 41534. (494.)(359.)(95.)(1176.11) COMP G C Mu.DA HR.AN PERICD RAIN EXCS LCSS COMP & MO.DA HR.MN PERIOD RAIN EXCS LOSS

\*\*\*\*\*\*\* CUMBINE HYDROGRAFHS \*\*\*\*

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JPRT INAME ISTAGE IAUTO 0 1 C 0 JPLT O IECON ITAFE 0 0 COMBINE 2 HYDROGRAPHS AT 7
ISTAG ICCMF
7

HYDROGRAPH ROUTING

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	ROUTE	CVER	DAM NO 2	(VIC A	NIMERE						
			ISTAG	ICLPP	IECON	ISTAG ICLAP IECON ITAPE	JPLT	JFRT	INAPE	JERT INAPE ISTAGE	12010
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		OF USS	CLUSS	) <b>&gt; 4</b>	IRES	ISAVE	IOFT	4		STR	
		o• o	0.000	ე∵•ე	-	-	5	0			
			NSTPS	NSTOL		AMSKK			STCPA	ISFRAT	
			-	0	0	0.11.0	033.3	007.0	-514.	Ü	
CAPACITY=	د			36.		140.		245.	010.	1126.	
ÉLEV∧710%≈	\$65.	\$	516.	514.	516.	515.		. 256.	525.	530.	
		ر 51	CREL SPN 514.5 142	SPW10	C.GW E.FW 5.2		ניפט (ניפט	0.00 CA	CAREA E	ExPL 0.0	
							UAM DATA				
					10 F E L 515.0		C0 EXFU 6 1.5	0AF . ID			

11164. AT TIME 50.00 HOURS PEAK COTILIN IS

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 PEAK CUTFLOW IS
 25c0b. AT TIME
 51.00 Hours

 FEAK OUTPLOW IS
 3009b. AT TIME
 51.00 Hours

 FEAK OUTFLOW IS
 50715. AT TIME
 51.00 Hours

 PEAK OUTFLOW IS
 4987b. AT TIME
 50.00 Hours

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#### SUB-AREA RUNAFF COMPLIATION

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	SUB ARE	A 12 R	1 4 C AU									
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	IHYDG	ນ <b>ກ ກ</b>	TAREA 1.03	SNAF 0.CC		HYDROGRAPH DATA TRSDA TRSPC 152.10 0.00	RATIC C.OCC	I SNOW	I SAME	) 1007	wa	
SPFc PMS 0.0C 18.50 E. COFFUTED BY THE PROUMAR IS 0.877	r PROUNA	SPFc 0.0C F. IS U.	PMS 18.50	85 25.00	FRECIP R12 97.00 1	P DATA R24 105.00	12C.00	R72 C.00	R96 C.00			

TASFC

ALSPX C.OC 0.10 STRTL 1.00 NTA= ( LOSS DATA
ERAIN STRKS RTIOK
C.CC 0.0C 1.00 UNIT HYDROGRAP! DATA TC= 1.13 R= 1.1. NT! 1.0C OLTKR O.OC STRKR 0.0C LROPT

STRTG= 2.LC GRCSN= 2.60 RTIOK= 1.CU

UNIT HYDROGRAFH / END-OF-FERIOD GRDINATES, LAG= 1.U7 HOURS, CP= 0.53 VOL= 1..C 193. 272. 199. 46. 1c. 7. 3.

U F::DA HR.:'N FERIOD RAIN EXCS LUSS COMP Q MO.DA HR.MW PERIOD RAIN EXCS LOSS

SU# 19.4¢ 15.7C 3.76 10584. ( 494.)( 359.)( 95.)( 299.71)

COMP

COMBINE - YON' GRAFES

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					HYDROG	HYDROGEAPH ROUTING	UTING						
		ROUTE	CVER DAN ISTAG	CVER DAM AT ANTWERF ISTAG ICCMF IECON ITAFE 8 1 0 C	ERF IECON	ITAFE	JFLT 0		RT 11	4 A P. E.	JPRT INAME ISTAGE 0 1 C	1 A U T O	
		0.058	0.00SS	) <b>, t</b> 6	ROU IRES	ROUTING DATA IRES ISAME 1 1	TA IOFT		# 8 3 0		LSTR		
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STAGE 4	78.064	70.534		13.594	16.794		30.118	5.6	562.00	20	503.50	\$05.00	510.00
flor	20-3	760.62		13.0061	3566.3 1		955C.JU	800	00.0108		10000.00	13.00.00	32000.00
CAFACITY=		.^	٠,٠	175.	265.		.024	. 198	. 999	•	765.	1250.	2470.
ELEVATION=	.067		463.	495.	. 267	35	.003	505.	504.		505	510.	518.
		767 767	CREL SP	SP410 0.0	3 J.J.	EXF. E	ELEVL C.C	0.0	CAREA 0.0	EXFL G.0	.0		
					TOFEL 491.1	0.00 0.00 0.00	۵	ATA EXFO CAMLID 1.5 C.	0.0				

11136. AT TIME 52.00 HOURS PEAK CUTFLOW IS

51.00 #0UFS 51.00 hturs 255ab. AT TIME 3.U38. AT TIME PEAK DUTFLOW IS FEAK OUTFLUE IS

51.60 E0UES 51.00 HOURS 49797. AT TIME 30725. AT TIME FEAK OUTFLC. IS PEAK CUTFLOW IS

02063. AT TIME 51.0G HOURS FEAK OUTFLUB IS

FEAR FLUA AND STURAGE (END OF PERICD) SUMMARY FOR MULTIPLE PLAN-RATIO ECCNOMIC COMPLTATIONS FLUAS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND) AREA IN SQUARE MILES (SQUARE KILOMETERS)

oFERAT10∴	STATION	ARLA	PLAN	KATIC 1 C.20	RATIG 2 0.40	RATIC 3 C.50	8ATIO 4 0.60	8ATIC 5 C.80	RATIC 6
HYDROGRAFF AT	-	3.62	-~	341.	65.71 17.36)(	755.	964.	1205.	1566.
ROUTED TO	.,	3.12.	- `	220.	472. 13.57)(	595. 10.96) (	736.	968. 27.42) (	1153. 33.70)(
HYDROGRAFF AT		18.11	-~	.45ť. 65.38) (	490u. 138.76)(	c125. 173.45)(	7351. 208.14)(	\$801. 277.52)(	12251.
HYDROGKAPE AT	1	11.03	-~	1230.	2460.	3C76. 87.09)(	3691. 104.51)(	4921. 139.34) (	6151.
S COMBINED	,~	34.76	_ ~	3765. 184.91) (	210.95)	9325.	11264. 317.26)(	14565.	18734. 530.48)(
ROUTED TO	× ,	32.76 84.85)	-~	3153. 89.29) (	6620.	8331. 255.50)(	10345. 292.55)(	14649.	17759. 502.67) (
MYDROGRAFF AT	, ~	17.37	, ,	2170.	434(.	5424. 153.60)(	6569.	8679. 245.77) (	10849. 307.21)(
PYDROGRAFF AT	^	19.65	_ `	<11/3. 01.53)(	4346. 123.07)(	5455. 153.83) (	6519. 184.cc)(	8692. 24c.13)(	10865. 367.ce)
3 CUMBINED	γ	65.72 180.73)	-~	7226.	14933.	1c771. 531.54)(	22929.	31C28. 876.62)(	39133.
PCUTED IN	, ~	05.18 1.0.73)	<u>.</u> ~	7245. 205.16)(	14914.	18722. 530.14) (	22839.	36954. 876.52) (	39682.
FYDR OKAFF AT	° ~	5.16 7.18)	٢ `	523. 146)(	1645.	1266.	1500.	2C90. 59.19)(	2613.
2 CoMbliseD	, ~	72.94 1co.11	-~	7573.	15632. 442.65)(	19655. 530.56) (	23972.	32488. 915.97) (	41000. 1161.00)(
POUTED TO	3	72.94	- ~	7295.	1513(463)(	19039.	23121.	31186.	31186. 39106. 883.14) (-1167.27) (

HYDRUGRALL AT	,	17.05	ĘŬ	2166. 61.35)(	4333.	5416. 153,37)(	6459.	8666. 245.39)(	10832. 306.74)(
HYDRUGRAFH AT	<b>у</b> С	6.60	<b>-</b> ~	942.	1885.	2356.	2827. 86.65)(	3769. 106.73)(	4712. 133.42)(
3 COMBINED	٠ <u>,</u>	95.59 (10.645	Ę	5717. 275.14)(	20127.	25355. 717.96)(	36759. 872.12)(	41452.	51954.
ACUTED TO	ູ້	95_99	- ~	:878. 251.4U)(	18869.	24(15. 681.62)(	29337. 830.72)(	35888.	\$6256. 1423.10)(
HYDRUGRAPH AT	<sub>2</sub> ~	11.70	٦	1456. 41.23)(	2912. 02.46)(	3£40. 163.06)(	4368. 123.70)(	5824. 164.93)(	7281.
PEDROGRAPH AT	11.	13.90	_ ~	1228. 34.7c)(	2455.	3069. 86.94)(	3683. 104.28)(	4910. 139.04)(	6138. 173.EC) (
3 CCMB14ED	, ~	121.59	-~	11117.	23511. 665.74)(	245.09)(	36562. 1035.32)(	49630. 1405.37)(	62434.
ACUTED T	. ~	121.59	<u>.                                    </u>	11,94.	235.9.	29284.	29284. 36448. 49466. 62315. 846.22)(1632.48)(1406.72)(1764.56)(	49466.	62315.
HYDRUGRAPH AT	1,	4.05 10.49)	-~	1126.	2241.	2,01.	3361.	4482.	\$662. 158.63) (
2 COMBINED	`	125.64	_~	11147.	23601. 670.01)(	3UC75. 851.62)(	3U(75. 30676. 851.62)( 1U38.56)(	49561. 1413.64)(	62859.
#CUTED T	` `	125.64	-~	11164. 316.12)(	23680. 670.20)(	36096. £52.22)(	3CC96. 36713. 49876. £52.22)(1639.60)(1412.32)(	49876. 1412.32)(	62799. 1778.26)(
FYDR CRAFF AT	16	1.63	_ ~	423.	345.	1557.	1268. 35.51)(	1691. 47.88)(	2115.
c COMBINED	ى ئ	126.67 328.07)	-~	11164. 316.13)(	23670. 670.24)(	3CG58. 852.28)(	36716. 852.28)( 1639.68)(	49882. 1412.49)(	49882. 62866. 1412.49)( 1778.48)(
FCUTED T		126.47	- ~	11156.	23528.	32.13¢. 850.57)(	\$2.136. 36729. 45797. 62613. 850.573 (1040.05) (1410.11) (1772.72) (	45797.	026(5.

STATION	
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TIME	HOURS	30.88	24.00	53.65
*AXI*UM	STAGE, FT	826.6	828.7	8.528
*AX1*U*	FLOWACES	.022	416.	• <b>6</b> 5 0
	RATIO	0.20	7.40	3 <b>(.</b> )

53.0C 53.0C 54.0C	2	TIME BC.0C 50.0C 50.0C 49.0C 49.0C	7	TIME 49.00C 49.00C 49.00C 48.00C 48.00C 48.00C	\$	1136 50.00 50.00 50.00 50.00 50.00 50.00	1138 F F F F F F F F F F F F F F F F F F F
831.9	STATION	MAXIMUM STAGE.F 688.5 689.7 690.2 691.2	STATION	MAXIMUM STAGE.18 692.8 695.7 696.7 696.7	STATION	#AXIFUM STAGE.FT 603.0 606.6 606.1 612.7 611.8	STAT 100N R R A X X Y Y X X X Y Y X X X Y Y X X Y X Y
7.50. 9.08. 1195.	L AN 1	MAXIMUM FLUMACES 3153. 6620. 8331. 10345. 17459.	LAN 1	FLOW.CFS 7245. 14914. 18722. 25839. 39.82.	LAN 1	MAXIFUR FLOWSCFS 72.95. 15130. 19639. 25181. 39106.	MAXIMUS PLOWACES CC78- 18869- 24.15- 24.37- 39.08
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11ME HOURS 52.00 51.00 51.00 51.00 50.00 FAXIBUM STAGE FT 5cL.4 522.5 523.4 524.3 525.7 SIALLUN MAXIBUM FLOW\*CFS 17.94. 23564. 29664. 36448. 62315. 7 H J 4 RATIO C.40 C.50 C.60 C.60 1.00

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# SUMMARY OF DAM SAFETY ANALYSIS

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\$		MAX CUTFLOW FAILURE							
FST TCF OF DAM 515.0C 53. 454.		CVER TOF MAX							
SHILLAY CREST 514.CC 50.	MAXIMUM	CUTFLO	25.3	11164.	23668.	30096.	36713.	45876.	65249
INITIAL VALUE 514.00 50.	KOKEKKK	STURAGE	AC-FT	117.	1//.	214.	240.	334.	410.
514	MONINCH	DEPTH	VER DAM	51.2	3.75	7.4C	5.05	6.23	42.6
ELEVATION STORAGE UTFLER	KUKEXVE	RESERVCIR	W.S.ELEV	517.15	513.75	214.40	520.05	>41.65	525.25
	RATIC	#0	PR	٦٧٠٠١	J <b>7</b> *J	05.0	0.60	28.0	1.00

AD-A086 351

NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/0 13/13

NATIONAL DAM SAFETY PROGRAM. DAM NUMBER 2. INVENTORY NUMBER NY --ETC(1))

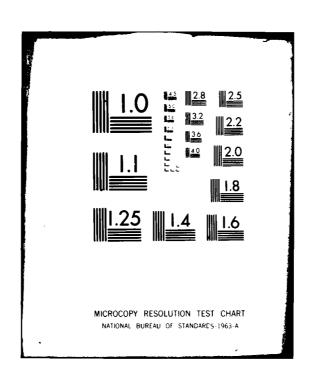
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# SUMMARY OF DAM SAFETY ANALYSIS

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	TIME OF FAILURE	HOURS	၁၁ <b>•</b> ဝ	ეე. 0	0.00	33.0	ງງ•0	00.0
10F 0F DAM 491.1C 27. 2C7.	TIPE OF MAX OUTFLOW	HOURS	52.00	51.00	51.00	51.00	51.00	51.00
	DURATION OVER TOP	HOURS	68.00	73.00	24.00	24.00	75.00	88.00
SPILLMAY CREST 490.3C C.	MAXIMUM	CFS	11136.	23588.	36638.	36729.	49797.	62603.
VALUE .30	MAAIMUM Storage	AC-FT	569	1035.	1195.	1401.	1820.	.1822
INITIAL VALUE 496.30	PAXIMUM DEPTH	OVER DAM	12.56	16.68	18,38	15.05	22.64	25.34
ELEVATION Storage Gutflow	MAXIMUM RESERVOIR	W.S.ELEV	50.4.05	507.78	519.48	510.59	513.74	510.44
	RATIO	± 0.	02.0	07-0	ئ <b>د.</b> ن	09*3	00.0	ລ <b>ະ ະ</b>

## PFC-108 ## 3 PFFC-108 ## 3 PFFC-108 ## 3 PFFC-108 ## 1 1\$	(0001)	4	DAM NO	144)	(ANTRERF)							
A3 PMF-DAM GREAK ALALYSIS  A3 PMF-DAM GREAK ALALYSIS  A1	(3000)	42	HEC-108									
# 9. 1	(606.3)	Ą	PME-DAM	BREAK	ALALYSIS							
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PREVIEW OF SEGLENCE OF STREAM NETWORK CALCULATIONS
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FLOOD HYDROGRAPH FACFAGE (HEC-1) DAM SAFETY VERSION JULY 1978
LAST MCDIFICATION &6 FEB 75 

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RUN DATE? NEU. VOV 14 1975 TIME?15:26:24 DAM NO 2 (ANTRERP)

FMF-DAM BREEK ARALYSIS

IFLT G METRO TRACE 0 JUB SPECIFICATION C LROPT Z I 2. I 3 <u>∓</u> 0 0 Осрев IDAY 2112 2 ₹

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MULTI-FLAN ANALYSES TO BE PERFURMED

U.40 G.50 U.A. C.20 1.00

SUB-AREA RUNIFF COMFUTATION

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JUNE JECON JINE SUB AREA 1 BIRGER ISTAG

HYDROGREPH CATA

LOCAL ISAME ISNO. 6.4TT9 SMAF TRSDA TRSFC 0.00 152.10 0.10 PRECIP LATA TAREA 3.Cc 1 PYC.

872 0.50 R12 R24 R48 57.11 115.12 121.05 TRSPC CUMPUTED BY THE PRUGRAM IS LABYZ

67114F C.L.C ALSPX C.CC CNSTL C.1C STRTL 1.CL 1.00 RT10K LUSS DATA
ATICL ERAIN STRKS
1.6L L.G( L.G( FLTKA F.OL STEKE ر د د LHOFT

UNIT HYLHUGARF DATA TC= 71.39 K= 11.39 HT

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SORMAL DEFTH CHANGEL ROLLING

CROSS SECTION COCHDINATES--STAAFLEVASTAALEV-FTC TOUGH ESCAPO 3FC.CL BAGGO 3. C.OC BSC.OC AFC.OF BZZ.OC 42C.OC AZZ.OO 45G.OU BSC.CD 875.OC 840.OC 10CC.OC 850.OU 822.6 850.0 46500.0.0050 64(1) 64(2) 8N(3) 1.6866 6.0866

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STAGE	322.00 836.74	823.47 838.21	824.45 839.68	826.42 841.16	327.49 842.03	629.37 844.10	830.84	.32.32 -47.05	633.79 848.53
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SUB AREA 2 BUNGT   1574   1500   1185   1810   1887   1885   1887
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## NCRMAL DEFTH CHANNEL ROUTING

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CUMBINE HYDE: GRAFHS

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TECON 11, (E. JELT 1981 INAME ISTAGE 1 (910) COMEINE S NYORPOHAPIS AT S ISTAG ICEAS

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٤ 3	***		ETU AREA 7 ISTAG ICUEP 4	00.00 PW3-0	NSTES NSTOL		ELNUT ELMAN POS.C 720.C	<pre>CRUSS SLCTIO. CLRDIAT UTSTARLEVASTRASLEUTETC 1.clm Zoskl 150.0. 716.66 575.00 755.00 1clm 776.0. 776.0. 716.0.</pre>	51.0£ 130£.77	1296.73	7.7.10	1250.11					
			CHANNEL ROUTE TO	550 JO		RCUTING	2720.J	. C RD1.27 S 9.c.   150.0. 6.c.   150.0.	1, .04	311.89	1,50.44 1,50.4	311.89 74793.09	0.260	695.7	256.1	497	***
	***		J			NGRMAL DEFTH CHAINEL RCUTING	44(1) 14(2) 14(4) 04(4)	Chuss Suctitu 1. u.m. 725 1844-00 775	273.15		. 5.6. 7 5.4.	-0. -11577.fin					
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## SUB-AREA RUNDEF COMPLIATION

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	Invo.

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LAUPT STRKK ULTKA KTICL FEBT STRKS KTICK STRTL CYSTL ALSPY Laul Gald Table Lade (also 1.00 1.00 6.10 0.00

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RECESSION DATA

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CAMML DEITH CHANNEL ACUTING

CA(1) UN(2) CH(3) ELNVI ELNAX KLNI) SEL G.C.C. (10450 G.DECC 595.C 626.C 43500: 0.00200

CHOSS SECTION COMPINATIS-STANDLEVACIANTLEVA-FIC

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OUTFLCS	19331.63		231.95	74.6.42 27554.8L	1835.36 32545.09	3126.81 37663.59	4924.60	7077.9C 50135.8C	9550.19	12466.C4 65337.88
STAGE	595.00 663.10		596.32	597.63	598.95 <b>612.1</b> 8	60C.26 613.42	651.58	602.89 616.05	£04.21 £17.37	605.53
FL	0-0-0 50-18541		271.95	275,44.27	1833.66	3124.81	4924.69	7077.9C 50135.8C	9550.19	12466.C4 65337.88
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NAMERUR STRUK 15	10£ 15	211.0								
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MAXIMUM STAGE IS	16e 18	1.300								
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SUB-AREA RUNGEF COMPLIATION

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SUB AREA 7 RUNOFF

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1ECON 0	HYCROGR TRSDA 152.10	FREC1 R12 97.J.
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UNIT HYDROGRAPH DATA

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COMP G LOSS KAIN EXCS Nound HP. of FEHIOD RAIN EXCS LOSS COMP 0 POLDA PR.MP PERIOD

SU\* 17.46 15.70 3.76 174869. ( 494.)( 599.)( 95.)( 4951.73)

SCH-AMER RUINFF COMPLIATION

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JERT INAME ISTAGE INUTO 15126 1C79F 1EC0N 1T2+E JELT SUB APER 9 KUDOFF

PYDROLPAPI DATA

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ם רמנער		# T			VOL = 1C 275. 59. 13. 3.	EVCS	15.76 (35%.	*			*			æ
JOANE L	896 0.00	ALS#X C.CC			CP= C.57 VO 321. 69. 15.	RAIR	19.46			T STAGE			FE ISTAGE	LSTR
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152.10	PREC16 R12 97.00	5	UNIT HYDROGRAPH DATA 54 R= 6.54 NT	RECESSION BRCSNIE	GROIS ATES, LAGE 33. 33. 110. Y. 44. 27. 27. 27. 24. 27. 27. 27. 27. 27. 27. 27. 27. 27. 27	70-01-01631-10-013		* *	Coafel of Pydas GRZENS	1866, 1	***	HYDROLLAFE FOUTING	IECC: 1	ALL FLATS HAVE SEVE RUTIN: LATA INES ISTAE A
SNAF O.CL	.5.0€	FRAIN C.00	÷	12.00	-FERICO 242.	E) 88 1			* (· )	2#2		¥	u	ALL ALL
148 E A 6. CC	PMS . SC	8710L 1.00	= 31	STRTG=	END-CF- 1. 2. 2.	EXCS L		****		ALLS AL U	***		II AREA C W ICKYE O	
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I HVUU 1	SP C. FROGRAF 1	STRKS 6.00			UNIT HYDRAGR	PERIOD R		:		Cobo The C	:		CHANTEL RO	
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## NORMAL DEFTH CHANNEL RCUTING

5	100.00 CECT)	10% CUURDINA 6.0% C. 2.0% 5.1% 8.5%	NATESST G.OC 590 G.OC 590	### CROSS SECTION COURDINATES STAFFLE V. STAFFLE V ETC		50.186 565.0C	00-012 00	265.00		
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OUTFLG.	. d.e. . 37141.91	56 4564	0.74	1836.26	\$730.04 65041.55	6232.67	5355.65	13119.19 100367.95	17>47.56 113772.08	22667.C9 127989.44
STAGE	505.0.	20.20	5.20	560.6. 587.10	5753 588.95	572.57 590.79	574.21 592.63	576.C5 594.47	577.89	579.74 598.16
14	141.72	504	,,	1034.22	3734.04 5504 .55	6638.67	9355.05	13119.19	17:47-56 113:72.08	22667.09 127955.44
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SE STATE STAGE ES	458 15	564.0								
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PARTY OF STACE AS	87 T.Y	276.4								
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FAALFUR SIACE 15

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	IHVEC	) . q <b>I</b>	1 A R E 2	8 A S S S S S S S S S S S S S S S S S S	HYDRO . R 14564 152-10	HYDRU-KAPH DATA TRSUM TRSEC 152-16	PAT10 L-UEE	# C N S II	ISAME LOCAL	, 1007
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		ر د	16.5	65.Ci	. 7.24	1,5.30	1/6.00	00.0	00.)	

(1511) L-1 1181 LOSS DOTA STAKS ATLA CALCO TAGE P715E FRAIG 1.11 0.50 LTKF STARE · ·

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UNIT HYDRYGEAFT DATZ

TC= 13.1c R= 15.1c ATA= C

RILLARS 1.55

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464. 263. 122. 57. 27. 12. 350. 350. 125. 125. 135. 135. 120 - 

9 4200 \$501 EMB-CF-PERICO FLOW
CAR C. AC. LA CH.M. FERIOU HAIN EXCS FACS READ TENED SAID

1.55

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SUM 19.46 15.70 3.76 158862. (454.)(359.)(95.)(5932.13)

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|------------|--|-----------------------|------------------|-------------------------------------|---|--------------|--------------|-----------------------------|-----------|
|            |  |                       | CLMBINE          | CLMBINE HYDROGRAFHS                 | A F HS  |              |              |                             |           |
| COMBINE    | COMBINE 3 HYDROGRAPHS AT 5 1STAG 16.4P         | FS AT 5<br>16.4P      | 1ECON<br>0       | ITAPE                               | JECON JTAPE JPLT<br>0 0 0                         |              | INAME<br>1   | JFRT INAME ISTAGE IAUTO U 1 | 12010     |
| 有我我我就会会会会  | ***  | * * *                 | *                | ****                                |   | ****         | * *          | *                           | ***       |
|            |  |                       | HYEROGE          | HYEROGFAFH ROUTING                  | I N C   |              |              |                             |           |
| CHANNEL P  | CHANNEL ROUTE THRU AREA 11<br>ISTAG ICTUP<br>1 | AREA 11<br>ICCPP<br>1 | IECON<br>U       | ITAPE<br>()                         | IECON ITAPE JALT                                  | ₽ 8          | INAME        | JERT INAME ISTAGE IAUTO     | 1 A U T O |
|            |  |                       | ALL FLA:<br>ROHI | ALL FLADS HAVE SAME<br>Rohting Data | 3 A IK E  |              |              | 1                           | •         |
| in<br>Sche | 030°C 0°3                                      | ۵ <b>۷</b> و<br>۲•دز  | IRES<br>1        | IRES ISAME LOFT                     | 101<br>1  | E 1          |              | LSTR                        |           |
|            | hSTFS  | ASTES SSTUL           |                  | AMSKK<br>O.CCC                      | LAS AMSKK X TSK STFRA ISFRAT<br>0 0.000 0.0001. C | TSK<br>C.CCU | STORA<br>-1. | ISFHAT                      |           |

Charle better transfer noutlys

| J      | .tobd              | U GEGEGG         |  | 14001. 6.60<br>#/[tev==110               | 94.00            |                  |                  |                     |
|--------|--------------------|------------------|--|--|------------------|------------------|------------------|---------------------|
|        | 1 50<br>y'custo 54 | 0.00 1000.00     | 1 or 30,000 court 36,00 40,000 36,00 365,0 314,00 000,00 514,00 40,00 40,00 40,00 514,00 | ); • • • • • • • • • • • • • • • • • • • | 525.C J14.3      | 5 5 5            | 514.07           |                     |
| STUBBL | 39.2<br>54.088     | 1164.6           | 1549.35  | 135.25<br>1545.9                         | 216.32           | 31.3.25          | 412,55           | \$0°95"7<br>\$\$°25 |
| rtHF.  | 74.3.07            | 156.5            | \$24.40<br>\$2.460<br>\$4.460  | 1358.73<br>42165.8                       | 2511.03          | 41,4.25          | 6254.65          | 24.99.94<br>24.145  |
| SIACE  | 514.60<br>526.46   | 514.64<br>565.66 | 515.60<br>5.4.10   | 516.55<br>524.95                         | 517.37<br>575.79 | 510.21<br>526.65 | 519.C5<br>527.47 | 19.89<br>128.31     |
| rt.    | 22025.01           | 155.91           | 596.1  | 1551.70                                  | 2511.05          | 6164.63          | 6254.65          | 46.8844             |

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SANISON STEAL IS

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677.C5 2699.57 526.74 529.16 12813.69 c7226.77

566.5 524.5 5.4.5 523.4 525.7 3.150 520.4 324.5 523.4 5.55.2 3.756 545.4 5.006 \*\* 571 524.5 5.63.8 , , , , , , MAXINUM STAGE IS MAXIFUR STAGE 1S MAXIFUM STAGE 1S NAMIFUM STAGE 15 WAAIRUM STAGE IS MAKIMUM STAGE IS ST 1041S BORTHER REALPOP STAGE IS PARITUR STAUF IS \*\*XIMUK STAGE 15 RANIAUP STAUF IS REALMUM STEAR IS ST SEATS WINDER CANE OF CIRES IS BANICOM CIRCL IS SI STATE STAGE IS SI - " A"AIXEA

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| 1946 1140           | FATIC IS                       |
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FRECII DOTA

SPF: PRS RC RTC RZ R4 R72 P90

G-0: 10-50 05-01 97-01 15-1 121-01 0-10 (1-10)

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|           | RTIYP | ) · (C        |                       |
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|           | ALSMX | JJ*0          |                       |
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|           | RIIOK | <b>1.</b> 00  | H CATA                |
| LOSS DATA | STRKS |               | HYCHCGRAPH<br>RE 2.74 |
|           | ERAIA | 9 <b>9</b> *3 | UNIT 0                |
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|           | STRKE | )).<br>)      |                       |
|           | LRUPI | ٠             |                       |

RECESSION DATA

STRTG= 8.00

8.00 RTIOR= 1.60

UNIT HYDROGRAFOL TO END-OF-FERTO OFDITATES LAGE 2.58 HOURS, CPE 0.58 VOLE 1..0 1. 464. 557. 468. 325. 225. 156. 108. 75. 1. 25. 17. 12. .. 6.

SUM 19.46 15.70 3.76 41534. (494.)(399.)(95.)(1176.11) COPF C END-OF-FERTO FLOW PAID EXCS LOSS COME OF ACTUAL PRING PERIOD RAIN EXCS LOSS 7. . . r.

CHATTE LYDE LAFFES

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JPRT INAME ISTAGE INLTO COMPLEAS THE STANDARY SALVE STATE STANDARY STAND

HALL LEADER ROUTING

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1 c10 SEFT TRAFF ISTAGE LSTR ST: RA 151 RAT -514. 30.18K X 15K 14:11 11:VI ALE FLA S MAVE CAME. \* (LTE THEU DEF E.C. 2 (WIC G.T.ERI)

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DAY BATA TUFEL C. GD EXFD DAMUID 515.0 2.6 1.5 1000.

EEGIN DAY FAILURE AT 44.CC HOURS

FEAK OUTFLOW IS 11181, AT TIME 52.50 Hours

EEGIN DAT HAILURE AT 41.10 POUKS

PEAK HUTFLIGHTS - 25-75. AT TIME 51.00 POUSS

BEGIN DAY FAILURE AT 40.00 POURS

PEAK CUTILEM IS 3 399. AT TIME 51.GU POURS

PEGIN DAN FAILUPE AT 59.LC PHURS

STATE OF THE THEORY OF THE PROPERTY OF THE STATE OF THE S

DEGIN DAY FAILURE AT 30.00 NOURS

FEAR JUTITION IS 44429. AT TIME SUIGO POUFS

PEAK SHITCH A 1S - A 2.15. AT TIME SCHOLOURS

al post : FCURS

BEST DAT FAILURE

DEGIN DA HATLIPS AT 44.( F. URS

FEAK JUTHER IS 11162. AT TIME 52.00 moves

REGIO DAL FRILDRE AT 41. U HOURS

PEAK PUTHER TS - 2000L. AT TIME STEAK PORTS

EEGIN DAN FAILURE AT 40.00 FOURS

PERK OLIVERANDS - S OFSERT TINE STUDO FOLES

WSEL 514.00 DAM CREACE DATA
Z ELFM TFAIL
1.. 505.40 1.00 ë₽kID 46.

51.5U MOURS

Series AT TIME

Si Clill 13

TELTS OF FAILURE AT 30.00 HOURS

51.00 HOURS

SUFEST AT TIME

FEAR LUTHING IS

LEGIT OF FAILURE AT BOACH HOURS

TELL OF FRILERE AT 39-LC HOURS

5C.00 hours

47.55. AT TIME

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AT 44-11 POURS ر د و بـ

52.00 rours 11175. AT TIEL .1 41. .. + "UPS 1.00 51 3 7.10 7 : 1

\$1.10 VOUES COCOL - AT TIME .: . 13 yea

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1 39.6. 1.0kS  51. I DLF S 1 ... 1 1.4.5 7

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3. 1.E. 1

Sector cobas 4 71 . AT 114: 24.7 ... T'L A.

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SUE-AREA RU JEF COMPLIATION

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ם הו ה JIAME ISTAGE T 1 + 1 C 1116 3 (4) 15.5 (\*\*)1 151-6 18 11 11 11 1 24.

TEST THAT THAT IS IS IS ICCAL \$ ... 16 5... 1 / 1 : **=** <u>:</u>

|             |  |                            |                      |                              |  | <b>0</b> d a 0 0   | 10584.  |   |                     |                            |               |                   |  |  |   |
|-------------|--|----------------------------|----------------------|------------------------------|--|--------------------|---|---|---------------------|----------------------------|---------------|-------------------|--|--|---|
| Đ           |  | ALSMX RT1.F                |                      |                              | 1.C7 HCURS, CP= 6.55 VCL= 1C<br>3.             | RAIN EXCS LOSS     | SUM 19.46 15.70 3.76<br>( 494.)( 395.)( 95.)( | *************************************** |                     | 151AuE 1 LTO               | * * * * * *   |                   | 157#6k 1 LTO<br>L C  | , ste  | 1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 |
| .3          | 9 D                                    | CNSTL AL<br>0.10 0         |                      | 0.0                          | . CP= C.55                                     |                    | SUM 19.                                       | * *                                     |                     | ≱<br>*I                    | * *           |                   | INAME<br>1   |  | 51.PA<br>- 4.00                         |
|             | a 872<br>C C.OU                        | STRTL C                    | Ų                    | RT108= 1.CU                  | .C7 HCLRS.                                     | KR.Mt. FERIOD      |   | ***                                     |                     | m<br>as<br>m               | 食物物物物物物物      |                   | 1.<br>F. F. F   | د بن<br>به<br><del>به</del>                        | 75%<br>C. U.C.)                         |
| 339°) 37°7  | 14 R48                                 | 8110K                      | OATA<br>NTA          | A1/                          | . A ( = 1.                                     | FLCW<br>RO.OA      |   | *                                       | HAFFS               | 1 J 1 L<br>L.              | *             | UIINC             | 3117   | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4              | * C                                     |
|             | PRECIP DATA<br>R12 R24<br>97.00 165.00 | LCSS DATA<br>STRKS<br>L.Cv | LNIT HYSROGRAPH DATA | RECESSIO+ DAT/<br>GRESN= 2+L | 7 ENG-OF-FERIOD CHOIPATES, LAG<br>119. 40. 10. | END-JE-PERICO FLOW |   | * * * * * * * *                         | CCMPTME LYDELGHAFFS | 16.00. 17.4g               | * * * * * * * | PEFOSCAPE CULLING | 1810's 1748'S  | ALC FLA N W NE SAPE<br>ROUTLY CATA<br>IMES ISANE I |   |
| u.ce 152.16 | FR RE R 8 85.00 97.                    | ERAIN<br>C.00              | LRIT H               | REC<br>2.66 9                | EKIPD CF0<br>46.                               |                    |   | ·                                       | ,13x2)              |                            |               | , Y L F.          | .Thire 1   |  |   |
| 1.63        |  | 1.0C                       | T C =                | STRTG=                       |  | 28.1 23x2          |   | * * * * * *                             |                     |                            | ****          |                   | VER DAM AT ABTUINE<br>ISTAG 160PF 18   | 28 AVG   | 15.4                                    |
| :           | SPFE PMS<br>G.CG 18.5U<br>IS U.877     | SLIKE<br>C.OC              |                      | S                            |  | ¥<br>•             |   | *                                       |                     | 2 EYEROGRAPHS AT 1STAG 1Ct | *             |                   |  | 58 CL088   | *STES                                   |
| -           | S<br>S<br>S<br>S<br>S<br>S<br>S        | STRKE<br>C.CL              |                      |                              | U-II HYDKJGRAFH<br>27c.                        |                    |   | **                                      |                     | 5 J' E I' 4E 5             | *             |                   | <b>9</b><br>13<br>13<br>13<br>13<br>13<br>13<br>13<br>13<br>13<br>13<br>13<br>13<br>13 | 5°.'   |   |
|             | COMILTED BY THE FROWRAM                | 7<br>14057                 |                      |                              | 175.   | GUEREN PERIOD      |   | ***                                     |                     | -                          | ****          |                   |  |  |   |
|             | COMILTE                                |                            |                      |                              |  | ند.<br>د<br>غ      |   |   |                     |                            |               |                   |  |  |   |

| 516.00  | 32000.00      | 2476.     | 518.       |                  |
|---------|---------------|-----------|------------|------------------|
| 30.838  | 13: 00.00     | 1250.     | 510.       |                  |
| 503.50  | 16066.66      | 765.      | 505.       | E X F L<br>0.0   |
| 512.515 | 80(1.00       | .000      | 504.       | CAREA<br>C.O     |
| 5(      | 308           | 566.      | 502.       | 0°0<br>0°0       |
| 311-00  | 655L.6t       | .025      | 500.       | 6.5<br>C.0       |
| 70*267  | 3561.01       | 265.      | . 292.     | Cr Gw E XFW (+2) |
| 79*55*  | 1966.61       | 175.      | . 565      | 0 GI 7 dS        |
| 493.UL  | 10.667        | ٠,۲٠      | 493.       | CREL<br>491.3    |
| 490.3c  | ₹ <b>0*</b> 5 | • 0       | 470.       |                  |
| STAGE 4 | FLC.          | CAP+CITY= | ELEv#T106= |                  |

DAM . ID CCCD EXFD 1011L

\$40 H DES 31.06 nours 11134. AT 11%c 23591. AT TIME FEAK JUTILLY IS PEAK JUTILUM IS

\$1.60 . cuts 3. .39. AT TIME HEAK GUTFL - IS

ST.VU MOLES \$11.60 Lags Surci. AT IIME 437:5. AT II. FEAK GUTHL'S IS FAR DISL . IS

\$1.00 nouses Section rates 11155. AT II\*8 DESIGN AT TIME PEAR OUTEINM 15 PEAK HUTFLIN IS

21. 1 . 1015 3:05- 7;\*L COSSC. AT TIME 5 547. AT TEF FEAK PUTFLIA 15 FEAR OUTAL IN IS

51.00 HM +S 3. /cc. AT TIME FEAK OUTFLOW IS

\$1.00 to 0.18 31. a trees \$ 10.00 497c1. AT TIME SCOULT AT TIME 11153. MT TIVE FER OTHER IS PEAK "LINEL IS FAR WILLIAM IS

51.60 AUNES 2009C. AT TIME 3 .. se. 11 Tie. FEAK CUTFLOW IS FAR OUTSELVES

50.750 . AT 1170 FEAR LUTHE 15

51.0 miles

4 . . . . AT 11/2

FLAK UDTELES IS

PEAK GUIFLOW IS GESTO. AT TIME 51.00 PUBES

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|               |         |        |      |           |              | KATIUS AFF      | RATIOS AFPLIED TO FLOWS | S#0   |           |
|---------------|---------|--------|------|-----------|--------------|-----------------|-------------------------|---|-----------|
| OFERATION     | STAT10. | AREA   | FLAX | 4ATIL 1   | 2 CI14H      | 64716 S         | RAT13 4                 | RATIC 5   | 8AT1C 6   |
| HYDRI GRAFT A | AT 1    | 3.(2   | -    | 361.      | 52.          | 755.            | 76.45                   | 1265.   | 1566.     |
|               | •       | 790.   | ,    | 501.      |              | 755.            | 914.                    | 1205.   | 1506.     |
|               |         |        | J    | 8.55)(    | -            | 21.32)(         | ) (55*57                | 34.12)(   | 42.65)    |
|               |         |        | .,`  | 15.7°     |              | 755.            | 7)6                     | 1205.   | 1566.     |
|               |         |        | _    | ) (50.    | 7 (3::-)     | 21.52)(         | 15.55)                  | 34.12)(   | 46.63)    |
| RCUTED T.     | •       | 3.02   | -    | . 25C.    |              | . 655           | 7.56.                   | .895  | 1155.     |
|               | ~       | 1.10   | _    | (22.)     | <del></del>  | 16,96) (        |                         | 27.42)(   | 33.78)(   |
|               |         |        | J.   | .377      |              | ***             | 736.                    | \$0 \cdot \cd | 1153.     |
|               |         |        | •    |           |              | _               | 26.t3)(                 | ) (25.72  | 55.78)(   |
|               |         |        |      | 1 1 2 1   |              |                 |                         | 201   | 1155.     |
|               |         |        | •    |           |              | 104.:1          | 1700.17                 | 1 (24.12  | 100.00    |
| YUK. FALL     |         | 111    | -    | . 156.5   | 4.7 L.       | -125.           | 7351.                   | Sec.1.  | 12251.    |
|               | •       | 46.70  | J    | (,2,3,)   | -            |                 |                         | 277.52)(  | 346.76)   |
|               |         |        | ,,   | 245t      |              |                 |                         | 5801.   | 12251.    |
|               |         |        | J    | 05.30)    | ·–           | 113.45)(        | 0 (8.14) (              | 211.36)(  | 1 (05.045 |
|               |         |        | • \  |           |              | . 165.          | 7351.                   |   | 12251.    |
|               |         |        | •    | (25.12)   | 15 .76)(     | 175.45)(        | ¿(c.14)(                | 277.52)(  | 346.50)   |
| . TUF KA A    | μq      | 11.63  | -    | 1-36.     |              | 11 10.          | \$051.                  | 4521.   | 6151.     |
|               | •       | 50.10  | _    | 54.84)(   | Č            | )(60.73         | 164.51)(                | 155.34)(  | 174.18)   |
|               |         |        | .7   | 1636.     | 7.47         | 5(77.           | 3551.                   | 4551.   | 4151.     |
|               |         |        | _    | 54.14)(   |              | •               | 164.51)(                | 135.34)(  |           |
|               |         |        | *1   | 1736.     | 640.         |                 | 3691.                   | 4551.   | 6151.     |
|               |         |        | ~    | 54.84)(   |              | )(50.18         | 164.51)(                | 159.54)(  |           |
| S Covel to    | ı       | 32.74  | -    | :27:5.    | 7.4.51.      | . 255.          | 11214.                  | 14565.  | 18734.    |
|               | _       | (6,.4) | •    | 114.71)(  | 4            | )(*)**07        | 317,26)(                | 423.73)(  | 156.40)   |
|               |         |        | J    | 37.5      |              | 4365            | 112 4.                  | 14965.  | 187.4.    |
|               |         |        | J    | 11,4.91)( | . 9          | (64.14)         | 317.26)(                | 423.75)(  | - '       |
|               |         |        | ĸ    | . 5 : 2 : | 7431         | 4325            | 112: 4.                 | 14565.  |           |
|               |         |        | •    | 104.71)(  | 10.75)       | )(*0**0>        | 317.66)(                | 423.75)(  | -,        |
| ESUTED T      |         | 34.76  | -    | .153.     |              | 8331.           | 11.345.                 | 14649.  | 17755.    |
|               | J       | 24. 5) | •    |           | <del>-</del> | ) ( ''6' ( 5' ) | ) (55.58)               | 397.83)(  |           |
|               |         |        | . 7  | 1153.     |              | .166.           | 16345.                  | 14149.  |           |
|               |         |        | •    |           | 167.47)(     | ) ( : 4 : . 5 ) | ) ( 55 - 75 3           | 397.23)(  |           |

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|  |      |                   | ٠, `          | 3153.<br>85.29)(  | 6625.<br>187.47)(  | 535.5u) (04.385   | 16345.  | 14649.<br>397.83)(   | 17759.  |  |
|--|------|-------------------|---------------|---|--|---|---|--|---|--|
| MYDRUSEAPF AT                            | , ~  | 17.37<br>44.59)   |               | 2176.<br>61.44)(<br>2176.<br>61.44)(<br>2176.<br>61.44)(    | 4340.<br>122.68)(<br>4344.<br>122.83)(<br>4340.                | 5424.<br>153.60)(<br>5424.<br>153.60)(<br>5424.<br>155.60)( | 65(9.<br>164.33)(<br>65(9.<br>184.33)(<br>65(9.<br>184.33)(               | 8679.<br>245.77)(<br>8679.<br>245.77)(<br>245.77)(             | 10849.<br>307.21)(<br>10849.<br>307.21)(<br>10849.                |  |
| HYDRCGEAN F AT                           | 5    | 15.05             | £ 2 % 2 % 2   | 2173.<br>61.53) (<br>2173.<br>61.53) (<br>7773.             | 4346.<br>123.07) (<br>4346.<br>1237) (<br>4346.                | 5433.<br>153.83) (<br>5433.<br>153.83) (<br>5433.           | 6519.<br>184.60)(<br>6519.<br>184.60)(<br>6519.<br>124.60)(               | 8692.<br>246.13) (<br>8692.<br>246.13) (<br>8692.<br>246.13) ( | 16865.<br>307.66)(<br>10865.<br>307.66)(<br>16865.<br>307.66)(    |  |
| 3 Cumulato                               | , ~  | 65.70<br>120.73)  | £ , , , , , , | 7220.<br>2(4.63)(<br>7226.<br>2(4.63)(<br>7226.<br>2-4.63)( | 14953.<br>422.86)(<br>14933.<br>422.45)(<br>14953.             | 16771.<br>531.54) (<br>18771.<br>531.54) (<br>16771.        | 22929.<br>649.29)(<br>649.29)(<br>649.29)(<br>22929.<br>22929.            | 31028.<br>878.62)(<br>31628.<br>878.62)(<br>31028.             | 39133.<br>1108-1130.<br>39133.<br>1102-1130.<br>39133.            |  |
| + CUTe D 1                               | •    | 37.50<br>1 (5.73) |               | 7445.<br>7445.<br>7445.<br>215.10)(<br>7445.<br>2(5.14)(    | 14914.<br>462.35)(<br>14714.<br>462.35)(<br>462.35)(           | 1872.<br>557.14) (<br>1725.<br>550.14) (<br>1872.           | 22839.<br>646.72)<br>646.72)<br>628.53.<br>646.72)                        | 3.554.<br>67.52)(<br>50.54.<br>676.52)(<br>3.554.<br>876.52)(  | 390°c.<br>116°c.69)<br>390°c.<br>116°c.69)<br>390°c.<br>115°c.69) |  |
| 14 C C C C C C C C C C C C C C C C C C C | -    | 5.10              | <b>-</b>      | 14.80) C<br>14.80) C<br>14.80) C<br>14.80) C                | 1345.<br>29.59) (<br>145.<br>29.59) (<br>1345.                 | 1200.<br>36.593 (<br>1310.<br>37.593 (<br>1200.<br>36.553 ( | 15:6.<br>44.39)(<br>15.8.<br>44.39)(<br>15.8.<br>44.39)(                  | 2590.<br>55.19) (<br>6590.<br>55.19) (<br>2590.                | 2613.<br>73.58)(<br>2613.<br>73.70)(<br>2613.<br>73.58)(          |  |
| 5 Cove 17 se                             |      | 72.54             | 1 2 ,         | (2/43.<br>(2/44) (<br>(2/33.<br>(2/444) (<br>(2/43.         | 15036.<br>442.65)(<br>15032.<br>442.65)(<br>15036.<br>442.65)( | 19655.<br>\$56.56) (<br>19655.<br>\$56.56) (<br>17657.      | 23976.<br>23972.<br>678.80.) (<br>23976.                                  | 32488.<br>919.97) (<br>32488.<br>919.97) (<br>52488.           | 4166.<br>4160.<br>4160.<br>1161.60.<br>1161.                      |  |
| AGUTEC T.                                | .a ~ | 72.24<br>182.51)  | _ , , , ,     | 7295.<br>276.56)(<br>7695.<br>267.56)(<br>76.55.            | 15150.<br>478.42)(<br>15150.<br>42-44)(<br>15150.<br>420.44)(  | 14(34.<br>559.16)(<br>15(35.<br>539.16)(<br>175.59.         | <pre>&lt;31c1. 65c.41)( &lt;31f1. 556.41)( 556.41)( 531.1. coc.41)(</pre> | 31126.<br>863.1U) (<br>31180.<br>883.10) (<br>31176.           | 39166.<br>1107.27) (<br>59166.<br>1117.27) (<br>39166.            |  |

| PYDKCGRAFF AT | ~   | 17.05            | -          | .166.                                   | 4353.         | 5410.     | 6699      | 8666.     | 10832.                                  |  |
|---------------|-----|------------------|------------|---|---------------|-----------|-----------|-----------|---|--|
|               | ~   | 44.16)           | ~          | 61.35)(                                 | 122.76)(      | 153.37)(  | 104.04)(  | 245.39)(  | 306.74) (                               |  |
|               |     |                  | <b>~</b> i | 2166.                                   | 4333.         | 5416.     | . 5579    | 8666.     | 10832.                                  |  |
|               |     |                  | <u> </u>   | 61.35)(                                 | 122.76)(      | 153.37)(  | 184.04)(  | 245.39)(  | 306.74)(                                |  |
|               |     |                  | ~          | .106.                                   | 4353.         | 5416.     | .6549     | 8666.     | 10832.                                  |  |
|               |     |                  | <b>-</b>   | 61.35)(                                 | 122.70)(      | 153.37)(  | 184.64)(  | 245.39)(  | 306.74)(                                |  |
| HYDRUGRAPH AT | ~   | 20-0             | -          | 545                                     | 1005          | 2356.     | 2827.     | 3769.     | 4712                                    |  |
|               | _   | 15.53)           | _          | 26,68)(                                 | 53.37)(       | 66.71)(   | 80,05)    | 106.73)(  | 133.42) (                               |  |
|               |     |                  | ~          | 545.                                    | 1885.         | 2356.     | 2827.     | 3769.     | 4712.                                   |  |
|               |     |                  | ~          | 26.68)(                                 | 53.37)(       | 66.71)(   | 80.05)(   | 106.73)(  | 133.42)(                                |  |
|               |     |                  | ~          | . 246                                   | 1605.         | 2356.     | 2827.     | 3769.     | 4712.                                   |  |
|               |     |                  | Ü          | 26.68)(                                 | 53.57)(       | 66.71)(   | 8C.(S)(   | 106.73)(  | 133.42)(                                |  |
| 3 6.481.60    | ic  | 55.56            | -          | ,717.                                   | 20127.        | 25255.    | 36754.    | 41452.    | 51954.                                  |  |
|               | J   | 646.61)          | _          | 275,14)(                                | \$67.72)(     | 717.90)   |           | 1173,793( | 1472.74)                                |  |
|               |     | ·<br>·<br>·<br>· | ٠. ٧       | 5717.                                   | 25116         | 25355.    | 20.75     | 41452     | 21054                                   |  |
|               |     |                  | , <b>~</b> | 275.14)(                                | ) (76,995     | 217,980 ( |           | 1173 7936 | 1672 763 (                              |  |
|               |     |                  | •~         | 5717.                                   | 20167         | 25355.    | 2077      | 41452     | 51666                                   |  |
|               |     |                  | <b>,</b>   | 275.14)(                                | 569.92)       | 717.96)(  | 472.12)(  | 1173.79)( | 1472.29) (                              |  |
| T METHOD      | •   | 20               | ,          | 3<br>N<br>X                             | ن<br>بر<br>بر | 37.048    |           | 000       | 73673                                   |  |
|               | , ` |                  | . `        | • •<br>:                                | 0000          |           |           | .00000    | 3,550                                   |  |
|               | •   | (13.343          | ٠          | 104.167                                 | 254.563       | 081.1231  |           | 1125.51)  | 1425.10) (                              |  |
|               |     |                  | ,          | - 2. Q                                  | 16575         | 24015.    | 29337     | 25483     | 56256.                                  |  |
|               |     |                  | , -        | 251.40)                                 | )(36.450      | 056.02)(  |           | 1125.51)( | 1423.16)                                |  |
|               |     |                  | ٠, ٠       | 2 | 1:36.5        | 24(15.    |           | 35888.    | 56.256.                                 |  |
|               |     |                  | ~          | () (') 5 ! . 5 ?                        | >54.56)(      | 080.040   |           | 1125.51)( | 1423.10)(                               |  |
| PYDRUGRAFF AT | -   | 11.70            | -          | 1456.                                   | 2,16.         | 3640.     | 4366.     | 5224.     |   |  |
|               | ٠   | 30.50)           | _          | 41.23)(                                 | .2.46) (      | 163,63)(  | 123,76)(  | 164.93) ( | 7                                       |  |
|               |     |                  | ~          | 1456.                                   | 2912.         | 3640.     | 4368      | 5824.     |   |  |
|               |     |                  | _          | 41.23)(                                 | )(347)        | 165,68)   | 165.70)   | 164.95)   | (16.16)                                 |  |
|               |     |                  | . ~        | 1454                                    | 6716.         | 3640.     | 4340      | 5.54.     | 727.1                                   |  |
|               |     |                  | J          | 41.63)(                                 | 2.41)(        | 103.60)(  | 123.70) ( |           | 266.16) (                               |  |
| HYDRUGRAFF AT | -   | 13.90            | -          | 1228.                                   | 2455          | 30.69.    | 3683.     | 4910.     |   |  |
|               | _   | 560)             | ~          | 34.70)(                                 | (20.6)        | 76.5.)    | 164.28)(  | 135.04)(  |   |  |
|               |     |                  | J          | 1228.                                   | 2455.         | 3(69.     | 3603.     | 4510.     |   |  |
|               |     |                  | ~          | 34.76)(                                 | (55.7)        | ) (05.90  | 164.28)(  | 134.04)(  |   |  |
|               |     |                  | 'n         | 1628.                                   | .455.         | 3064.     | 3683.     | 4910.     | 6138.                                   |  |
|               |     |                  | J          | 54.76)(                                 | )(20.,)       | ) (65.75  | 164.6")(  | 139,04)(  | 175.200                                 |  |
| S CUMBILED    | ٠.  | 121.59           | <b>~</b>   | 11117.                                  |               | 24644.    |           | 45630.    | 52434.                                  |  |
|               | •   | 5141)            | Ų          | 314.76) (                               | •             | (45.64)   | 1         | 14(5,37)  | 1707.35)                                |  |
|               |     |                  | 'n         | 11117.                                  |               | 25244.    | 30566.    | 45630.    |   |  |
|               |     |                  | ~          | 514.00)                                 |               | )(40.44)  | 1,55.56)( | 1405.37)  | _                                       |  |
|               |     |                  | 'n         | 11117.                                  | 23511.        |           | 36562.    | 45630.    |   |  |
|               |     |                  | •          | 314.00) (                               |               | )(40.843  | 1035.32)( | 1405.37)( | 1767.533                                |  |
| 1 0 186       | ~.  | 121,56           | -          | 11:44                                   | 5 55 1        | X         | 37772     | 44757     | 47.815                                  |  |
|               |     |                  | -          | •                                       |               | •         | • > 1     |           | • |  |

| 1154, 2350, 2950, 29684, 3 11594, 2350, 29684, 3 11594, 2350, 29684, 2350, 25684, 2350, 2350, 29684, 2350, 2350, 29684, 2350, 2350, 2340, 2350, 2241, 2601, 2601, 2241, 2601, 2601, 2241, 2601, 2241, 2601, 2601, 2241, 2601, 2601, 2241, 2601, 2601, 2241, 2601, 2241, 2601, 2601, 2241, 2601, 2601, 2241, 2601   |               | J   | 514.51)   | _          | 514.15) (                               |                  | 366, 237      | 1(2) (2)                                | 4 CE 3074                               |                                       |
|--|---------------|-----|-----------|------------|---|------------------|---------------|---|---|---------------------------------------|
| ( 314-15) ( 665-69) ( 846-22) ( 1032-08) ( 404-62) ( 404   |               |     |           | w          | 11594.                                  |                  | 29884         | 36448                                   | 44004                                   | 1/04.20/1                             |
| 11.54.   1.5   |               |     |           | <b>~</b> , | 314,15)(                                |                  | 840.22)(      | 1032.08)                                |   | 1764.56)(                             |
| 11   |               |     |           | η`         | 71094.                                  |                  | 29584         | 36448.                                  |   | 62315.                                |
| 11   |               |     |           | ,          | 214.133                                 |                  | 846.22)(      | 1032,083(                               |   | 1764.36)(                             |
| 10.492   | HYDRUGRATE AT | 11  | 4.05      | <u>,</u>   | 1126.                                   |                  |               | 3361.                                   |   | 6463                                  |
| 1120, 2241, 2861, 3361, 3461, 1420, 14482, 1120, 2241, 74,321, 95,1891, 126,991, 1120, 2241, 74,321, 95,1891, 126,991, 1120, 2241, 76,321, 95,1891, 126,991, 1120, 126,991,  |               | ~   | 10.4%     | ~          | 31,73)(                                 |                  |               | 95, 18) (                               |   | , , , , , , , , , , , , , , , , , , , |
| 31.73)   |               |     |           | ·v         | 1120.                                   |                  |               | 3361.                                   |   | 5653                                  |
| 1120.   2241.   3361.   3361.   4482.     34.73)(   63.45)(   79.32)(   95.15)(   126.97)(   126.   |               |     |           | _          | 31.73)(                                 | 63.45)(          | 79.32)(       | 55.18)                                  |   | 2000                                  |
| 31.73)   |               |     |           | 7          | 1120.                                   | 2241.            | 2267.         | 3361.                                   |   | 2,472                                 |
| 125.64   11147   25661   50175   36676   455614   456614   45661   |               |     |           | J          | 31,73)(                                 | 63.45)(          | 79.32)(       | 95.16)(                                 | 126.91)(                                | 158.63)                               |
| ( 325.4c) ( 315.4c) ( 270.7) ( 851.6c) ( 14.20.2) ( 14.30.7) ( 4.7   | z COMBINED    | ~   | 125.64    | -          | 11147.                                  |                  | 411.75        | 44474                                   | 10000                                   |                                       |
| 1147.   23671.   36075.   1147.   11   |               | _   | 323.40)   | _          | 315,65)(                                |                  | · / · 4 - · 2 | 7147 02 1                               | *************************************** | 76279                                 |
| ( 315.95) ( 970.01) ( \$51.62) ( 103.56) ( 1413.04) ( 1 1147.  |               |     |           | >          | 11147.                                  |                  | 300.75        | 34474                                   | 7 * 0 * 0 * 0 * 0 * 0 * 0 * 0 * 0 * 0 * | ) (94.47)                             |
| 3 11147. 23661. 36752. 36676. 49571.  ( 315.64   |               |     |           | ~          | 315.65)(                                |                  | 151.622       | 70.42                                   |   | . A.C. 200                            |
| ( 315.65) ( c/u.u.1) ( 851.62) ( 1438.56) ( 1413.64) ( 1 325.64) ( 1 31181. 23675. 36792. 45629 ( 1 315.62) ( 230.46) ( 252.32) ( 140.128) ( 1413.28) ( 1 315.62) ( 230.46) ( 252.32) ( 140.128) ( 1413.28) ( 1 315.62) ( 230.22) ( 140.128) ( 1413.28) ( 1 315.62) ( 230.22) ( 1413.28) ( 141   |               |     |           | ~1         | 11147.                                  |                  | 36.625.       |   | 1 (\$2.00 V                             | 1119,767                              |
| 7 125-64 1 11181, 23675, 3f(199, 36772, 49729) 7 325-40)   |               |     |           | v          | 315.65)(                                |                  | 851.64)(      |   | 1415.6416                               | 1116 511                              |
| 355.40   | Routen T.     | ٨   | 77 364    | ,          | ,                                       |                  |               |   |   |                                       |
| **************************************   |               | . ` | *0*C3C*   | - `        | 1181.                                   | 23675.           | 36755         | 367:2.                                  |   | 62815.                                |
| ### 1762. ####################################   |               | -   | 134*676   | <b>-</b> , | \$16.62)(                               | 670.46)(         | £52.32)(      | 1646,12>(                               |   | 1778.72                               |
| 1178. 23650. 511.36) (1035.55) (1411.29) (17  511.45) (692.70) (552.39) (1138.72) (1411.29) (17  511.45) (692.70) (552.39) (1138.72) (1413.53) (17  611.47) (52.49) (52.49) (52.49) (52.49) (47.80) (47.80) (52.49) (47.80) (47.80) (52.49) (52.49) (47.80) (47.80) (52.49) (52.49) (52.49) (47.80) (47.80) (52.49) (52.49) (52.49) (47.80) (47.80) (52.49) (52.49) (52.49) (52.49) (52.49) (47.80) (4   |               |     |           | √`         | 77162.                                  | 23666.           | 36,65,        | 36765.                                  |   | 6.285.6                               |
| *** 11175. \$365. \$2102. \$3662. \$4949.  ( \$1.45) ( \$669.70) ( \$56.59) ( \$128.72) ( \$415.53) ( \$15.52) ( \$12.52) ( \$1415.53) ( \$15.52) ( \$12.52) ( \$                        |               |     |           | , -        | 574,050                                 | \$ { * 0 * 0 2 9 | 851.36)(      | 1039.55)(                               |   | - ( ) - 12 - 1                        |
| ( 510.45)( 669.70)( £50.39)( 10.38.72)( 1413.53)( 13  ( 71.97)( £3.94)( £9.92)( \$5.91)( 47.80)( 20.92)( 55.91)( 47.80)( 20.92)( 55.91)( 47.80)( 20.92)( 55.91)( 47.80)( 20.92)( 55.91)( 47.80)( 20.92)( 55.91)( 47.80)( 20.92)( 55.91)( 47.80)( 20.92)( 55.91)( 47.80)( 20.92)( 55.91)( 47.80)( 20.92)( 55.91)( 47.80)( 20.92)( 55.91)( 47.80)( 20.92)( 55.91)( 47.80)( 20.92)( 20.92)( 25.91)( 47.80)( 20.92)( 20.92)( 25.91)( 47.80)( 20.92)( 20.92)( 20.92)( 25.91)( 47.80)( 20.92)  |               |     |           | *7         | 11175.                                  | 23630.           | 26.162.       | 30612.                                  |   |                                       |
| ( 11.03  |               |     |           | <u>~</u>   | 510.4536                                | 669.70)(         | 256.593(      | 1638.72) (                              |   | 178C.71)                              |
| ( 2.57) ( 11.97) ( 25.94) ( 25.91) ( 47.80) ( 47   |               | 1,  | 1.03      | -          | 423.                                    | 248              | 16.57         | 5 7 6 1                                 |   | ,                                     |
| **************************************   |               | ~   | 2,57)     | _          | 11 422                                  | 77777            | 1000          | 12376                                   | 1693.                                   | 2115.                                 |
| **************************************   |               |     |           |            |   | 1746.003         | ) ( 26 ' 6 2  | 55.57)(                                 | 47.80)(                                 | 164.43                                |
| **************************************   |               |     |           | , -        | 11 521                                  | * A A A A A      |               | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | 1651.                                   | 2113.                                 |
| ( 11.97) ( 23.94) ( 25.92) ( 25.91) ( 47.81) ( 4   |               |     |           | 7          | ~ ~ ~ ~                                 | 77777            | 1 ( 2 6 3 6 7 | 35.473                                  | 21.00.74                                | 55.45)                                |
| ( 328.67   |               |     |           | ~          | 11.97)(                                 | 3.44)(           | 0.08.52       | 25.5130                                 | 1641.                                   | 2135.                                 |
| ( 328.57) ( 310.4.) ( 50.44) ( 52.38) ( 141.14.) ( 1411.46) ( 170.44) ( 52.38) ( 141.14.) ( 1411.46) ( 170.44) ( 52.38) ( 141.14.) ( 1411.46) ( 170.48) ( 17   |               |     | 134 67    | ,          | ,                                       |                  |               |   | •                                       | 160.65                                |
|  |               |     | 10 10 1 X |            | 11166                                   | 2567             |               |   |   | 64666                                 |
| ( 314.05) (5014, 51.07) (56.4.) ( 314.09) ( 50.49) ( 851.42) ( 141.(2) ( 5411.16) (  |               |     | 120.040   | _          | 316.64)(                                | 070.44)(         | 154.5831      |   |   | 1478.55)                              |
| 7 1776. 23652. 36164. 36615. 457(6)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)   |               |     |           |            | 11165.                                  | c 5014.          | 51.1 05       |   |   | 64816.                                |
| ( 316.46)( 669.75)( 656.45)( 10.36.76)( 1415.70))( ( 316.46)( 669.75)( 656.45)( 10.36.79)( 1415.70))( ( 316.46)( 668.01)( 856.6))( 10.36.98)( ( 315.27)( 668.01)( 856.6))( 10.36.98)( ( 315.27)( 668.75)( 856.80)( 146.49)( ( 315.25)( 668.16)( 856.80)( 146.61)( 1469.65)( ( 315.25)( 668.16)( 856.81)( 166.64)( 1417.24)( ( 315.25)( 668.16)( 856.81)( 166.64)( 1417.24)(  |               |     |           | _          | ~ | )(4, 0/4         | 851.42)(1     | . 1(2).347                              |   | 1778.7.)                              |
| ( 316.46)( 0.09.75)( 0.56.45)( 10.36.79)( 1415.70)( ( 3.00.67)   |               |     |           |            |   | < 3652.          | \$0104.       |   |   | 1,20 55.                              |
| ( 3.0.0.0.) ( 315.27)( 6.001)( 25001)( 10.54.92), 45723. ( 315.27)( 6.001)( 25001)( 10.54.92)( 140404)( 11.34. 23592. 36(47. 3626. 49781. ( 315.42)( 6.002)( 83603)( 10.4017)( 146905)( 311.33. (3554. 360 36736. ( 315.25)( 6.016)( 6.5616)( 6.5616)( 10.017)( 10.017)( 10.0 10   |               |     |           | ~          | 516.46)(                                | 0.69.7537        |               |   |   | 1786.500                              |
| \$60.67) (\$15.27)(\$66.01)(\$50.01)(\$1.57.5)(\$140.69)(\$1.55.01)(\$1.55.5)(\$140.69)(\$1.55.5)(\$140.69)(\$1.55.5)(\$1.55 | RCUTED T.     |     | 120.47    |            |   | 73563            |               |   |   | ,                                     |
| 11136. 23592. 3.0(404.69)( 517.41)( 665.72)( 85(.63)( 1041.17)( 1469.65)( 11133. 2354. 30036. 36736. 49780. 315.25)( 664.16)( 650.51)( 1040.41)( 1411.22)  |               |     | 360.67)   | J          |   | 665.613.6        |               |   |   | 62664.                                |
| 515.4(1) ( 662.72) ( 85(.85) ( 1640.41) ( 1469.65) ( 11133.  |               |     |           |            |   | 23567            |               |   |   | 116.14)                               |
| 11133. 23544. 30036. 122517(1404502)( 315.25)( 600.16)( 650.51)( 1040.24)( 1410.20)  |               |     |           |            | 515.41)(                                | 066,13)          |               |   |   | 66661.                                |
| Eba.16) ( ESC.51) ( 1640.44) ( 1410.24)  |               |     |           |            | 11133.                                  |                  |               |   |   | (57.5)                                |
|  |               |     |           | J          | 315.25) (                               |                  |               |   |   | 21074                                 |

STATION

ILAN 1

| 1011<br>55.00<br>54.00<br>55.00<br>53.00<br>53.00<br>53.00       | 2       | ######################################                             | v       | E 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0                     | *1      | ######################################  | TIME TIME                            |     |
|--|---------|--|---------|---|---------|---|--------------------------------------|-----|
| PAKIMUM<br>STAGE.FT<br>826.6<br>828.7<br>825.5<br>836.2<br>831.2 | STATION | MAXIMUM<br>STAGE / FT<br>826.6<br>824.7<br>824.5<br>830.2<br>831.2 | STAT10N | 8 4 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1                     | S1A110N | AAX A A A A A A A A A A A A A A A A A A | STATION  MAXIMUM STAGE FF            | U   |
| PAXIMUM<br>FLOWACES<br>220.<br>472.<br>599.<br>730.<br>966.      | AN 2    | MAXIMUM<br>FLOW.CFS<br>226.<br>472.<br>599.<br>730.<br>968.        | LAN S   | MAXINUS<br>FLOWICES<br>626.<br>672.<br>792.<br>799.<br>799. | ١ ، ٩   | # # # # # # # # # # # # # # # # # # #   | AN C<br>MAXIMUM<br>FLUBACES<br>A15.5 | 2.0 |
| RATIO<br>C.20<br>C.40<br>C.50<br>C.80<br>C.80                    | 14      | A A T L O C  | F.L.    | 0 10 0 2 2 0<br>1 14 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1      | -       | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0   |                                      |     |

| 70.00<br>44.00<br>49.00<br>00.00          | 8        | 11ME<br>50.00<br>50.00<br>50.00<br>50.00<br>49.00<br>49.00         | 4       | T 4 4 4 1 4 4 E E E E E E E E E E E E E E                        | 4       | 744444<br>E 749444<br>E 74944<br>E 749444<br>E 8000000000000000000000000000000000000  | 4<br>- 544444<br>- 500 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2   |
|---|----------|--|---------|--|---------|---|--|
| 696.2<br>696.2<br>696.6<br>691.2<br>691.8 | STATION  | MAXIMUM<br>STAGE.FT<br>628.5<br>626.7<br>690.2<br>690.6            | STATION | #AX1#U#<br>STAGE.FT<br>642.8<br>045.7<br>646.7<br>646.7<br>7.2.8 | STATION | 2 4 4 X 1 X 1 X 1 X 1 X 1 X 1 X 1 X 1 X 1   | STACE STACE STACE T STACE T SYS S SYS  |
| 6660.<br>6331.<br>10345.<br>14049.        | LAN 3    | MAXIMUM<br>FLOWNCES<br>3153.<br>6420.<br>8531.<br>10345.<br>17759. | LA% 1   | 109×1018<br>7245<br>7245<br>14514<br>18722<br>50 54              | LAN 2   | 70xx3.00x<br>12xx6.f.S<br>72xx5.<br>14x14.<br>18x22.<br>50x3x.<br>50x3x.  | AN 5<br>EXTENS<br>FLUW CFS<br>74.5<br>14.14<br>14.14<br>12.25<br>2.25<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.75<br>3.7 |
| 1000+<br>1000+<br>1000                    | <u>.</u> | A A C C C C C C C C C C C C C C C C C C                            | ã       | RATIO<br>C.+60<br>C.50<br>C.50<br>C.50<br>C.50                   | 7       | 0 2 - 1 0 2 - | 0.174<br>0.174<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00   |

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| 11ME<br>HOURS<br>50.00<br>50.00<br>50.00<br>50.00<br>50.00             | ın.     |
|--|---------|
| MAXIMUM<br>STAGE of T<br>603.0<br>606.6<br>608.1<br>609.4<br>611.8     | STATION |
| MAXIMUM<br>FLOW.CFS<br>72.95.<br>15130.<br>19139.<br>23129.<br>331186. | >       |
| 4<br>01<br>04<br>00  | PLAN    |

| 11ME<br>SC.00C<br>SO.00C<br>SC.00C<br>SC.00C<br>SC.00C | 20 <b>.</b> 00 |
|--|----------------|
| FAX1PUM<br>STAGE * FT<br>665.0<br>665.0<br>668.1       | 615.           |
| 15150.<br>15150.<br>15150.<br>15150.<br>15150.         | 0.11.0         |
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| \$      | 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2                            |
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| NOTITIS | STAKET<br>STACE<br>STACE<br>60.5.0<br>60.5.0<br>60.00.0<br>60.00.1 |
| 1.65    | 7 A X 1 - C C C C C C C C C C C C C C C C C C                      |
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| ی       | TIME         | H C U R S       | 56.00        | 51.00      | 51.06  | 51.0C  | 36.0C     | 10     |
|---------|--------------|-----------------|--------------|------------|--------|--------|-----------|--------|
| STATION | FAXIMUM      | STAGE , FT      | 6.578        | 518.4      | 586.1  | 3.1.6  | 5.485     | 500.00 |
| 11.8%   | VIIV I X A 6 | 3 4 3 4 5 7 1 1 | . 27         | 10.00      | .4.15. | 25337. | * 2 × 3 % |        |
| -       |              | `               | <b>) •</b> . | <i>s</i> . |        |        |           | :      |

| ۷.                                    | 1181<br>1004        |  |
|---------------------------------------|---------------------|--|
| STATION                               | PAXIPUN<br>STASEAFT |  |
| , , , , , , , , , , , , , , , , , , , |                     |  |
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| 54.60<br>51.00<br>51.00<br>51.00<br>50.00 | 11ME<br>HOURS<br>52.00<br>51.00<br>51.00<br>50.00<br>50.00                  | 10000000000000000000000000000000000000  | \$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0           | ## 1000<br>## 1000<br>## 1000<br>## 1000<br>## 1000         |
|---|---|---|--|---|
| 5 2 2 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3   | STATION<br>RAXIHUM<br>STAGE.FT<br>573.9<br>576.4<br>586.1<br>564.0<br>564.0 | STAUE + TT 1000<br>STAUE + FT<br>SCC + S<br>SCC + S<br>S<br>SCC + S<br>SCC + S<br>SCC + S<br>S<br>SCC + S<br>S<br>S<br>SCC + S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S | 101  | A A A A A A A A A A A A A A A A A A A                       |
| 24.015.<br>24.015.<br>29.537.<br>39.58.   | A 2   | 1   | 7. 3. 1. 1. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. | 2000<br>2000<br>2000<br>2000<br>2000<br>2000<br>2000<br>200 |
| 00 00 00 00 00 00 00 00 00 00 00 00 00    | 4<br>5-14-13-13-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-                              | 011.4   |  |   |

1.CC 62515, 527.0 50.0C SUMMARY OF DAM SAFETY ANALYSIS

|   | STURAGE                          |                  | 56.<br>56.<br>U.                      |                           |                               | 515.8L<br>53.<br>454.           |                             |
|---|----------------------------------|------------------|---------------------------------------|---------------------------|-------------------------------|---------------------------------|-----------------------------|
| AAT 10<br>01<br>126   | MAXIMUM<br>RESERVOIR<br>SAS PARK | FALFUR<br>DEFIN  | STORING                               | FAXIAUM<br>CUTFLOW<br>CFS | DURATION<br>CVER TOF<br>HOURS | TIME OF<br>MAX CUTFLEW<br>ECHRS | TIME CF<br>FAILURE<br>HOURS |
| Ú.24<br>U.24<br>U.24<br>U.24<br>U.24<br>U.24<br>U.24<br>U.24<br>U | 216.00                           |                  | .57                                   | 11161.                    | 29.42                         | 52.00                           | 44.00                       |
| 0.4%  | 21/449                           | 54.7             | 126.                                  | 25675.                    | 44.24                         | 51.00                           | 41.00                       |
| 35.5  | 313.15                           | 3.1¢             | · · · · · · · · · · · · · · · · · · · | 3.0.99                    | 97.69                         | 22°L                            | 22.04                       |
| ن د<br>د د د<br>د د د د   | 519.67                           | 7 4              | 107                                   | 45634                     | 00.10<br>00.40                | 30.08                           | 34.00                       |
| 10.1  | 521.60                           | <br>             | 515.                                  | 02815.                    | 53.74                         | 20.05                           | 33.00                       |
| •   |                                  | INITIAL VALUE    | VALLE                                 | SFILLWAY CREST            |                               | TCF OF DAM                      |                             |
|   |                                  |                  | •)                                    |                           |                               |                                 |                             |
|   | 7 LEV: 110.                      | , L C            | 30 T & E &                            | 314.LC<br>36.             |                               | 515.UC<br>53.                   |                             |
|   | 1010                             |                  | •                                     |                           |                               | 454.                            |                             |
| 117   | 7                                | -<br>-<br>-<br>* | X                                     | MINIKUM                   | 008.110%                      | 101011                          | TIME CF                     |
| <b>*</b>  | RESERVATO                        | PEPTA            | 1 48,72                               | CUTFLON                   | CVER TUF                      | MAX CUTFLUE                     | FAILURE                     |
| <u>.</u>  | m - 5 . E L E V                  | Cark car         | 1.6-61                                | 543                       | HOURS                         | ► LURS                          | HOURS                       |
|   | <i>y</i> , •                     |                  | • 5. )                                | 11162.                    | 16.54                         | 37.75                           | 44.66                       |
| ر<br>رو<br>د  | 516.51                           | - ^ · ·          | • ~ C F                               | 2369Z•                    | 54.05<br>0 x x x              | 51.00                           | 77.07                       |
|   |                                  |                  |                                       | 20,000                    | 10.74                         | 22.10                           |                             |
| ر.  |                                  | 7.4              |                                       | 47625                     | 46.54                         | 30.05                           |                             |
| •   | 36.7. 4                          | 5 4              | .45.                                  | 666.18.                   | 94.40                         | 56.66                           | 33.00                       |
|   |                                  | Privo Tellial    | 361180                                | SFILLWAY CPEST            |                               | TEF OF DAM                      |                             |
|   | . LEVA110 .                      | 514              | 514.00                                | 314.60                    |                               | 515.PC                          |                             |
|   | 810830E<br>0166. 1               |                  | 50.                                   | \$¢.                      |                               | 53.<br>454.                     |                             |
| E & T [ 0   | M I W I W I W                    | *3*IX4*          | A CATY CA                             | *64170*                   | UURAT 10↑                     | TIME C.F                        | TIME CF                     |
| -   | RESCOVEIS                        | LEFT.            | 51 - 64 - 12                          | 6014103                   | GVEF TOF                      | MAX CUTFICE                     | FAJLURE                     |
| 7.0   | <b>b</b> .5.€∟€∨                 | CALR LAY         | ) · ·                                 | 2 .                       | Swaan                         | PULPS                           | HOURS                       |
| . 7•  | 510.34                           | <b>5: -</b> (    | • / •                                 | 11175.                    | 36                            | 56.61.                          | 77.75                       |
| ) <b>†</b>  | 217. 4                           | 7                |                                       | 63657.                    | ر-<br>در:<br>در:              | j. 15.                          | 41.CE                       |
| t.>t  | 76.61                            |                  | 171.                                  | 5:1:5                     | , , , ( <sub>0</sub>          | ، ۲۰ رژ<br>ا                    | )) <b>*</b> )               |
| :c.   | 514.45                           | ۲۰۰۶             | • • • •                               | 56632.                    | 56.500                        | 51 <b>.</b> LL                  | 34.00                       |
| <b>.</b>  | [4": 7"                          | ٦٠٠١             | . ,, .                                | . 27.1%                   | 61                            | ارا• در                         | 3×. LL                      |
| ر.  | 7                                |                  | **                                    | ,                         |                               |                                 |                             |

# SUNMARY OF DAY SAFETY ANALYSIS

| RATIO             |                 |   |                                       |                |  | 7            |               |
|-------------------|-----------------|---|---------------------------------------|----------------|--|--------------|---------------|
| 011               | STORAGE         |   |                                       | نن             |  | 27.<br>2C7.  |               |
|                   | MAXIMUM         | MAXITUM                                       | MAXIMUR                               | MOWINE         | DUKATION                                 | TIME OF      | TIME OF       |
| 40                | of Choung IR    | 11.0  | STORANE                               | 011 F1 04      | CVER TOF                                 | MAX CUTFICE  | FATLURE       |
|                   |                 | CARR CAR                                      | 14-74                                 | CFS            | HOURS                                    | , curs       | HOURS         |
|                   | 50.4.30         | 12.96   | 4.49                                  | 11134.         | 68.00                                    | 52.00        | 00.00         |
| . 4.              | 2010            | 16.68   | 1035.                                 | 23591.         | 73.00                                    | 51.CL        | 20.0          |
| . 50              | 5(9.46          | 18.38   | 1195.                                 | 54.639.        | 74.00                                    | 51.00        | )).<br>)      |
| 22.               | 510.55          | 19.05   | 14.1.                                 | 30,727.        | 74.00                                    | 51.00        | 0.00          |
| 12.1              | 513.74          | 55.64   | 1820.                                 | 49783.         | 75.00                                    | 51.00        | 0.00          |
| - A-1             | 210.44          | 65.54   | . 1822                                | 02604.         | ©⊃.<br>88                                | 51.00        | ງງ•ງ          |
|                   |                 | TE:TT:A: VALUE                                | VALLIF                                | SETTINA CR     | 1  | TOF DAW      |               |
|                   | FILEWATIO       |   | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |                |  |              |               |
|                   | CLEVALIO.       | 7   | <b>.</b>                              | 71.064         |  | 77           |               |
|                   | . 1417.         |   | • •                                   |                |  | .757         |               |
|                   |                 | ,<br>,  | ;                                     | 3              |  |              |               |
|                   |                 |   |                                       |                | - 01 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 |              |               |
| 5 3               | X 1 7 7 1 X     |   | # # # # # # # # # # # # # # # # # # # | *011100        | 101 X 102                                | 多つ コルーコン・大大学 | FAILURE       |
| ₩ 6<br>6 11       | A 2 1 2 5 C 1 4 | 1   |                                       | 23.4           | C 1001                                   | 2            | 7 2 2         |
| د.<br>4 په<br>د د | 77.             | , ,   |                                       | · (757)        | 7.5                                      | 21.5         | ن ر<br>ن د    |
| ) ,<br>(1) (1)    | 2.6.5           | ·   |                                       | 30,642         | 74.                                      | 31.13        | )<br>()<br>() |
|                   | .1.             | 73.41   | . 6 3                                 | \$2.68.        | 74.0                                     | 31.10        | ر<br>د د<br>د |
| ٠                 | ,15,74          | 5,-22   | 1.66                                  | 477.1          | ()                                       | 1 1 5        |               |
| 1                 | 216.44          | 45.54   | . 66.51.                              | 62431.         | 90.00                                    | 51.00        | ) ) · )       |
|                   |                 | INTIBE VALUE                                  | 4.0 L. L                              | CHIELWAY CHEST |  | 101 OF 1027  |               |
|                   | FULLO           | - 7   |                                       | 1              |  | 491.1.       |               |
|                   | N 10.83         |   | . 5                                   |                |  | . / .        |               |
|                   | HIFE.W          |   | . J.                                  | ز              |  | 262.         |               |
| 117               | 414-7           | 4 × 1 × 0.5                                   |                                       | 29 m 1 8 % a   | .0115363                                 | 3 T 2 A E E  | 13.3411       |
| <u>.</u>          | KESTEV TR       | 1.66.71                                       | ST PALL                               | CU1610.        | TOT HIP                                  | VAX CUIFICA  | FAILURE       |
| F 1 - F           | S . L L . V     |   | C - E 1                               | C+3            | HOURS                                    | 2 K-10 F     | HODE          |
| 17.               | 2.4.1           | 12.70   | 611.                                  | 11155.         | 30.18                                    | ٤٤٠١٤        | L.C.          |
| .4.               | 2. (            | 16.68   | 1635.                                 | < >> 560       | 75                                       | 511          | i ( .         |
| . 50              | 21.7.40         | بع<br>- ۱۰ - ۱۰ - ۱۰ - ۱۰ - ۱۰ - ۱۰ - ۱۰ - ۱۰ | 114.                                  | 5:136.         | 7.3.4/                                   | 51.60        | 17.           |
| . (. (.           | ,10.,,          | 15. 5   | 14. 1.                                | 56736.         | 74.: 11                                  | 51.iC        | ( • ( )       |
| 7.2.              | >15.74          | 47.77   | 1021.                                 | 4 7 4          | 751                                      | 51.15        | רינו          |
| •                 | . ic. 44        | 47.472  |                                       | 200160         |  | 3.1.1.       | -             |

APPENDIX D
STRUCTURAL STABILITY

## STETSON • DALE BANKERS TRUST BUILDING DESIGN BRIEF TEL 315-797-5800

| PROJECT NAME  |  | DATE  |
|---|--|---|
| SUBJECT Antwerp   | Dan #2   | PROJECT NO.   |
| Stability   | Computations   | DRAWN SY  |
| Assumed Sect  |  | •   |
|   |  | 7 PMF E 322   |
| PMF T.W. ELEV ~ 516   | £L 515   | V 12 PMF EL ~519  |
| 1/2 PMF TW. ELEV~509  | 12.3'   EL 505   | P= 9'(60 4ps-) = 0.562" it  |
|   | Pu varior  | pressure  oquel to Promal increasing to zero  tied over 100% of projected horiz |
| Resisting Monient $M_R = 0.15 \text{ kef} \left[ (7.4) \right]$ |  | of Jam (about toe) .23') + (12.3')(+3/2)(2/3*4.3')]/                            |
| MR = 108.8 k  |  |   |
| = 1/2 (9')( Moment du = 1/2 (11.7')(.5) Moment due = 5*(11.3')  | e to upstream (1.562 1/4t) (2.3' + 3') = 1<br>e to uplift<br>62 xsf) ( $\frac{3}{3}$ + 1/7') (1') = 2<br>to see $5$ C EL<br>) = $56.5$ L | 3.4 **<br>5.64 **<br>514 , 1'thek   |
| F.S. = 108.8  | 14 + 56.5 = 1.14 (c  | iplist, ice)  |
| $F.S. = \frac{108.8}{39} =$                                     | 2.8 luplift, no  | ice)  |

F.S. = 1.56 ICe, no uplift



| PROJECT NAME   | DATE                                       |
|--|--|
| SUBJECT  | PROJECT NO.                                |
|  | DRAWN BY                                   |
|  | ·/·  |
| B. Sliding  Weight of Dam = 0.15 ke                                  | f(1)[/a(2.3)X4.3) 4(7.4)X(23)-1/4(2.3)X24) |
| = 76,5   |  |
| Upstream Ho Pressure =   | 12(9)(1)(,562Ksf) - 2.5K                   |
| Uplift (1) 1/2 (11.7) (0.56.   | 2 tst)= 3.3 t                              |
| Ice 5 <sup>k</sup>   |  |
| Friction - Shear method a<br>between concrete and bed<br>coefficient | rock $\mu = 0.65$ friction                 |
| F.S. sliding HORIZ. H20 + IC   | 22<br>Le                                   |
| $F.S. = 0.65 (16.3^{2}-3.3^{4})$                                     | + (0.05 KSi) (144 "/2) (11,7")             |
| = 12 t (includio   | 19 10e)                                    |
| = 37+ (no 10   |  |

### STETSON - DALE BANKERS TRUST BUILDING DESIGN BRIEF TEL 315-797-5800

| POLICT NAME   | DATE  |
|---|---|
| NA. IPCT  | PROJECT NO.                                 |
|   | DRAWN BY                                    |
| C. Possible Earthquake Enects Site could be considered in Zone 3 horiz, seismie coeff = 0.10 and a cons value of 0.10 for vert, seismie coeff.  | servation                                   |
| $\overline{X} = \frac{108.8^{1-\kappa}}{16.3\kappa} = 6.67$   | essur <b>c</b>                              |
| $\vec{y} = \left[ 7.4(12.3)^{2}/_{2} - \frac{1}{2}(2.3)(7.4)(2.3)(3.4) + \frac{1}{2}(12.3)(4.3)(4.3)(\frac{12.3}{3}) \right]$ $16.3^{4}$  | ] (.15) = 6.09'                             |
| Water turface ( normal rec)  Total Horiz. Increase in force V. above any of  Ve = 0.726 Pe y  Pe = increase in 460 pressure due to EQ  y = vert. dist. from reservoir surface to  Te = C > Wh  C = 173 for y = 9' Fig. 222 Iesm  Pe = .73 (0.10)(.0624 ESF)(9') = 0.041 / ft  Ve = 0.726(.041 / ft)(9') = 0.268 K  Me = total overturning moment above that | eleu. Guestron<br>n ci Smuil Dans.<br>eleu. |
| Me = 0.299 Pe $y^2 = 0.299 (.041 \% e)(9.)^2 = 0.99$<br>:. Pe 15 beated $\frac{.993^{1-K}}{.260^{K}} = 3.71'$ above Reboth  | 193 <sup>1-K</sup><br>SIR VOIR              |

#### STETSON - DALE BANKERS TRUST BUILDING DESIGN BRIEF TEL 315-797-5800

| TEL 315-797-5800   |                      |
|--|----------------------|
| PROJECT NAME   | DATE                 |
| BUBJECT  | PROJECT NO           |
|  | DRAWN BY             |
| : Moment about toe due to increa   | Told 490             |
| ME = 0.268 (2.3'+37') = 1.61 th<br>Max. add's overturning moment from conduct to foundation. Movement  | nerete mass          |
| Jul to Loundation. MOVENERE $= (0.10) 16.3^{K} (6.67' + 6.09') = 208'^{-K}$  |                      |
| F.S. = 108.8 - = 0.92  | (EQ, Ice &) uplifé   |
| F.S. = 108.8 = 1.77 (  | eq & uplist) no ice  |
| I tosition of resultant from Toe, d=   | <u>EM</u><br>EV      |
| i) $u_p = 1.02' = 0.09 b$ $d = \frac{(108.8^{1-\kappa} - 95.54^{1-\kappa})}{(16.3^{\kappa} - 3.3^{\kappa})} = 1.02' = 0.09 b$  | outside middle third |
| ii) Uplift, no ice   |                      |
| $d = \frac{(108.8 - 39)}{13} = 5.37' = 0.46 b$ i.i.i) Eq. uplift no ree $d = \frac{(108.8^{14} - 61.4^{1})}{13^{14} \cdot 163^{14}} = 4$   | dd ,                 |
| $(13^{-1.63^{-1$ | 1.17'= 0.366         |

#### STETSON - DALE BANKERS TRUST BUILDING DESIGN BRIEF TEL 315-797-5800

| ROJECT NAME   | DATE   |
|---|--|
| DUBJECT   | PROJECT NO   |
|   | DRAWN BY   |
|   | T. C.  |
| II 1/2 PMF  | N ( )  |
|   | 4'(.0624 KSF) = 0.25 */F4  |
| $\Lambda$   |  |
| F   |  |
|   |  |
| 0.374 KE  | 14'(,0624xst) = 0.874 K/L+   |
| = 6'(.0624155)  |  |
|   | Assume uplift pressure does not have time to increase over short time                              |
|   | Frame of flood, therefore saire as normal  |
|   | conditions,  |
| Note: Small nertical common   | nent of downstream H2O neglected   |
| A. Overturning  Moment due to up.  = 0.25 kft (10') (5'+2.3') + 16  Resisting inoment due  = 0.374 kft (6'/2) (6'/3)  F.S. = 108.8 + 2.2  35.8+25.6 | 24 FAz (10/2) (10/3+2.3°) = 35,8 1-x<br>e to tailwater<br>= 2.24 1-x                               |
| 35,8+ 25, <b>6</b>  |  |
| B. Sliding Upstream Hoo force Downstream Hoo force  | =(.25 +.874) 4/4 ( 16/2) = 5.62 k<br>= 3'(.37444) = 1.12 k   |
| F.S. = 0.65(16.3-3.3) +(0.05  | $\frac{(15i)(144)^{10}(12)}{62^{10}} \frac{(11.7') + 1.12^{10}}{5.62} = 92.7 + 1.12}{5.62} = 16.7$ |
| C. Position of Resultant  | (full uplift)  |

 $d = \frac{(111 - 61.4)}{13} = 3.82' = 0.33b$ 

### STETSON • DALE BANKERS TRUST BUILDING DESIGN BRIEF TEL 315-797-5800

| ECT NAME   | DATE                            |
|--|---------------------------------|
| EGT  | PROJECT NO                      |
|  | DRAWN BY_                       |
| 13'(.0624Kst) = 0.811 Kft 17'(.0624Kst)  | )= 0.437 K/SE<br>S)= 1.061 K/AE |
| A. Overturning  Moment due to upstream $H_2O$ = $(0.624\%t)(\frac{10'}{2})(3.33'+2.3') + (0.437\%t)(10')(5'+2.3') = 4$         | <sup>1</sup> 9.5 <sup>7-K</sup> |
| Resisting moment due to tailurater = $(.0624 \frac{k}{4})(12')(\frac{12}{2}) + 12'(.0624 ksf)(\frac{12}{2})(\frac{12}{3}) = 2$ | 2.5 <sup>1-K</sup>              |
| F.5. = $\frac{108.8 + 22.5}{49.5 + 25.6} = 1.75$ (full uplift)  B. Sliding   | <i>4</i> )                      |
| Upstream 420 Force = 101/2 (1.061+.437)  | KAt - 7.5K                      |
| Downstream H20 Force = 121/2 (.0624 + .811)  | KH = 5.25                       |
| $F.5. = 92.7^{k} + 5.25^{k} = 13^{t}$  |                                 |
| C. Position of Resultant (full uplift)   |                                 |
| $d = \left(\frac{131.3 - 75.1}{13}\right) = 4.3' = 0.37b$  |                                 |

APPENDIX E

REFERENCES

#### APPENDIX

#### REFERENCES

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